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The impacts and challenges of water use of electric power production in China

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References

- (1) Esfahani, A.N., Moghaddam, N.B., Maleki, A., Nazemi, A. The knowledge map of energy security. *Energy Rep.* 2021,7,3570-89.
- (2) Arderne, C., Zorn, C., Nicolas, C., Koks, E.E. Predictive mapping of the global power system using open data. *Sci Data.* 2020,7,19.
- (3) Liu, J., Hull, V., Godfray, H.C.J., Tilman, D., Gleick, P., Hoff, H., Pahl-Wostl, C., Xu, Z., Chung, M.G., Sun, J., Li, S. Nexus approaches to global sustainable development. *Nat Sustain.* 2018,1,466-76.
- (4) Huang, S.-W., Chung, Y.-F., Wu, T.-H. Analyzing the relationship between energy security performance and decoupling of economic growth from CO₂ emissions for OECD countries. *Renew Sustain Energy Rev.* 2021,152.
- (5) Chini, C.M., Djehdian, L.A., Lubega, W.N., Stillwell, A.S. Virtual water transfers of the US electric grid. *Nat Energy.* 2018,3,1115-23.
- (6) Chu, S., Majumdar, A. Opportunities and challenges for a sustainable energy future. *Nature.* 2012,488,294-303.
- (7) Xu, S. Governing the energy–water nexus in China: An analysis from the perspective of the science–policy interface. *J Environ Manage.* 2020,272,111119.
- (8) Jin, Y., Behrens, P., Tukker, A., Scherer, L. The energy-water nexus of China's interprovincial and seasonal electric power transmission. *Appl Energy.* 2021,286,116493.
- (9) Bleischwitz, R., Spataru, C., VanDeveer, S.D., Obersteiner, M., van der Voet, E., Johnson, C., Andrews-Speed, P., Boersma, T., Hoff, H., van Vuuren, D.P. Resource nexus perspectives towards the United Nations Sustainable Development Goals. *Nat Sustain.* 2018,1,737-43.
- (10) Chini, C.M., Peer, R.A.M. The traded water footprint of global energy from 2010 to 2018. *Sci Data.* 2021,8,7.
- (11) Zhou, Y., Ma, M., Gao, P., Xu, Q., Bi, J., Naren, T. Managing water resources from the energy - water nexus perspective under a changing climate: A case study of Jiangsu province, China. *Energy Policy.* 2019,126,380-90.
- (12) Li, N., Chen, W. Energy-water nexus in China's energy bases: From the Paris agreement to the Well Below 2 Degrees target. *Energy.* 2019,166,277-86.
- (13) Jin, Y., Tang, X., Feng, C., Höök, M. Energy and water conservation synergy in China: 2007–2012. *Resour Conserv Recycl.* 2017,127,206-15.

- (14) Feng, C., Tang, X., Jin, Y., Höök, M. The role of energy-water nexus in water conservation at regional levels in China. *J Clean Prod.* 2019,210,298-308.
- (15) Wang, S., Liu, Y., Chen, B. Multiregional input–output and ecological network analyses for regional energy–water nexus within China. *Appl Energy.* 2018,227,353-64.
- (16) Jin, Y., Behrens, P., Tukker, A., Scherer, L. Water use of electricity technologies: A global meta-analysis. *Renew Sustain Energy Rev.* 2019,115,109391.
- (17) Magagna, D., Medarac, H., Hidalgo González, I. Projected fresh water use from the European energy sector : disaggregated fresh water withdrawal and consumption in the EU up to 2050. Publications Office, European Commission. 2018.
- (18) Ganguli, P., Kumar, D., Ganguly, A.R. US Power Production at Risk from Water Stress in a Changing Climate. *Sci Rep.* 2017,7,11983.
- (19) Howells, M., Hermann, S., Welsch, M., Bazilian, M., Segerström, R., Alfstad, T., Gielen, D., Rogner, H., Fischer, G., van Velthuizen, H., Wiberg, D., Young, C., Roehrl, R.A., Mueller, A., Steduto, P., Ramma, I. Integrated analysis of climate change, land-use, energy and water strategies. *Nature Climate Change.* 2013,3,621-6.
- (20) Webster, M., Donohoo, P., Palmintier, B. Water–CO₂ trade-offs in electricity generation planning. *Nature Climate Change.* 2013,3,1029-32.
- (21) International Energy Agency. *World Energy Outlook 2021.* 2021.
- (22) Chai, L., Liao, X.W., Yang, L., Yan, X.L. Assessing life cycle water use and pollution of coal-fired power generation in China using input-output analysis. *Applied Energy.* 2018,231,951-8.
- (23) Zhang, C., Zhong, L., Wang, J. Decoupling between water use and thermoelectric power generation growth in China. *Nat Energy.* 2018,3,792-9.
- (24) Scherer, L., Pfister, S. Global water footprint assessment of hydropower. *Renew Energy.* 2016,99,711-20.
- (25) Chu, S., Majumdar, A. Opportunities and challenges for a sustainable energy future. *Nature.* 2012,488,294.
- (26) van Vliet, M.T.H., Wiberg, D., Leduc, S., Riahi, K. Power-generation system vulnerability and adaptation to changes in climate and water resources. *Nature Climate Change.* 2016,6,375.

References

- (27) Verones, F., Hellweg, S., Antón, A., Azevedo, L.B., Chaudhary, A., Cosme, N., Cucurachi, S., Baan, L., Dong, Y., Fantke, P., Golsteijn, L., Hauschild, M., Heijungs, R., Jolliet, O., Juraske, R., Larsen, H., Laurent, A., Mutel, C.L., Margni, M., Núñez, M., Owsianiak, M., Pfister, S., Ponsioen, T., Preiss, P., Rosenbaum, R.K., Roy, P.O., Sala, S., Steinmann, Z., Zelm, R., Van Dingenen, R., Vieira, M., Huijbregts, M.A.J. LC-IMPACT: A regionalized life cycle damage assessment method *J Ind Ecol.* 2020,24,1201-19.
- (28) D’Odorico, P. The global food–energy–water nexus. *Rev Geophys.* 2018,56.
- (29) Dorber, M., Mattson, K.R., Sandlund, O.T., May, R., Verones, F. Quantifying net water consumption of Norwegian hydropower reservoirs and related aquatic biodiversity impacts in Life Cycle Assessment. *Environ Impact Assess Rev.* 2019,76,36-46.
- (30) Chini, C.M., Stillwell, A.S. The changing virtual water trade network of the European electric grid. *Appl Energy.* 2020,260,114151.
- (31) World Nuclear Association. Electricity Transmission Systems. 2020.
- (32) Dang, Q., Lin, X., Konar, M. Agricultural virtual water flows within the United States. *Water Resources Research.* 2015,51,973-86.
- (33) Xia, W., Chen, X., Song, C., Pérez-Carrera, A. Driving factors of virtual water in international grain trade: A study for belt and road countries. *Agric Water Manage.* 2022,262.
- (34) Allan, J.A. Fortunately there are substitutes for water otherwise our hydro-political futures would be impossible. . *Priorities for Water Resources Allocation and Management.* 1993.
- (35) Zhao, X., Liu, J., Liu, Q., Tillotson, M.R., Guan, D., Hubacek, K. Physical and virtual water transfers for regional water stress alleviation in China. *Proc Natl Acad Sci U S A.* 2015,112,1031.
- (36) Zhao, X., Li, Y.P., Yang, H., Liu, W.F., Tillotson, M.R., Guan, D., Yi, Y., Wang, H. Measuring scarce water saving from interregional virtual water flows in China. *Environ Res Lett.* 2018,13,054012.
- (37) International Energy Agency. Key World Energy Statistics 2021. 2021.
- (38) CoalSwarm. Global Coal Plant Tracker. 2019.
- (39) Zhang, C., Anadon, L.D. Life Cycle Water Use of Energy Production and Its Environmental Impacts in China. *Environ Sci Technol.* 2013,47,14459-67.
- (40) Lv, H., Yang, L., Zhou, J., Zhang, X., Wu, W., Li, Y., Jiang, D. Water resource

References

synergy management in response to climate change in China: From the perspective of urban metabolism. *Resour Conserv Recycl.* 2020,163.

(41) Liang, X., Li, J., Guo, G., Li, S., Gong, Q. Evaluation for water resource system efficiency and influencing factors in western China: A two-stage network DEA-Tobit model. *J Clean Prod.* 2021,328.

(42) Liao, X., Hall, J.W., Eyre, N. Water use in China's thermoelectric power sector. *Global Environmental Change.* 2016,41,142-52.

(43) Yang, Y., Qu, S., Cai, B., Liang, S., Wang, Z., Wang, J., Xu, M. Mapping global carbon footprint in China. *Nat Commun.* 2020,11,2237.

(44) The State Council of the People's Republic of China. The speech made by Xi Jinping at the UN Biodiversity Summit. 2020.

(45) Mallapaty, S. How China could be carbon neutral by mid-century. *Nature.* 2020,586,482-3.

(46) Pöyry (Beijing) Engineering and Consulting Company Limited. The impacts of China's commitment to achieve carbon neutrality. 2020.

(47) Zhao, Z. Power generation companies are unveiling carbon reduction plans. *China Energy News.* 2021.

(48) China Electricity Council. Annual development report of China's power industry. 2020.

(49) Wu, C.B., Guan, P.B., Zhong, L.N., Lv, J., Hu, X.F., Huang, G.H., Li, C.C. An optimized low-carbon production planning model for power industry in coal-dependent regions - A case study of Shandong, China. *Energy.* 2020,192.

(50) The State Council of the People's Republic of China. Biodiversity Conservation in China. 2021.

(51) China Electricity Council. Annual compilation of statistics of power industry. 2018.

(52) Webster, M., Donohoo, P., Palmintier, B. Water-CO₂ trade-offs in electricity generation planning. *Nat Clim Change.* 2013,3,1029-32.

(53) Behrens, P., van Vliet, M.T.H., Nanninga, T., Walsh, B., Rodrigues, J.F.D. Climate change and the vulnerability of electricity generation to water stress in the European Union. *Nat Energy.* 2017,2,17114.

(54) Hejazi, M.I., Voisin, N., Liu, L., Bramer, L.M., Fortin, D.C., Hathaway, J.E., Huang, M., Kyle, P., Leung, L.R., Li, H.-Y., Liu, Y., Patel, P.L., Pulsipher, T.C.,

References

- Rice, J.S., Tesfa, T.K., Vernon, C.R., Zhou, Y. 21st century United States emissions mitigation could increase water stress more than the climate change it is mitigating. *Proc Natl Acad Sci USA*. 2015,112,10635.
- (55) Peng, W., Wagner, F., Ramana, M.V., Zhai, H., Small, M.J., Dalin, C., Zhang, X., Mauzerall, D.L. Managing China's coal power plants to address multiple environmental objectives. *Nat Sustain*. 2018,1,693-701.
- (56) Mouratiadou, I., Biewald, A., Pehl, M., Bonsch, M., Baumstark, L., Klein, D., Popp, A., Luderer, G., Kriegler, E. The impact of climate change mitigation on water demand for energy and food: An integrated analysis based on the Shared Socioeconomic Pathways. *Environ Sci Policy*. 2016,64,48-58.
- (57) Beal, C.M., Archibald, I., Huntley, M.E., Greene, C.H., Johnson, Z.I. Integrating Algae with Bioenergy Carbon Capture and Storage (ABECCS) Increases Sustainability. *Earth's Future*. 2018,6,524-42.
- (58) Gerbens-Leenes, W., Hoekstra, A.Y., van der Meer, T.H. The water footprint of bioenergy. *Proc Natl Acad Sci USA*. 2009,106,10219-23.
- (59) Hoekstra, A.Y. A critique on the water-scarcity weighted water footprint in LCA. *Ecol Indic*. 2016,66,564-73.
- (60) Hoekstra, A.Y., Chapagain, A.K., Aldaya, M.M., Mekonnen, M.M. The water footprint assessment manual: setting the global standard 2011.
- (61) Raptis, C.E., Boucher, J.M., Pfister, S. Assessing the environmental impacts of freshwater thermal pollution from global power generation in LCA. *Sci Total Environ*. 2017,580,1014-26.
- (62) Boulay, A.-M., Hoekstra, A.Y., Vionnet, S. Complementarities of Water-Focused Life Cycle Assessment and Water Footprint Assessment. *Environ Sci Technol*. 2013,47,11926-7.
- (63) Macknick, J., Newmark, R., Heath, G., Hallett, K.C. Operational water consumption and withdrawal factors for electricity generating technologies: a review of existing literature. *Environ Res Lett*. 2012,7.
- (64) Fthenakis, V., Kim, H.C. Life-cycle uses of water in US electricity generation. *Renew Sustain Energy Rev*. 2010,14,2039-48.
- (65) Meldrum, J., Nettles-Anderson, S., Heath, G., Macknick, J. Life cycle water use for electricity generation: a review and harmonization of literature estimates. *Environ Res Lett*. 2013,8.
- (66) Mekonnen, M.M., Gerbens-Leenes, P.W., Hoekstra, A.Y. The consumptive

- water footprint of electricity and heat: a global assessment. *Environ Sci-Wat Res.* 2015,1,285-97.
- (67) Pfister, S., Saner, D., Koehler, A. The environmental relevance of freshwater consumption in global power production. *Int J of Life Cycle Ass.* 2011,16,580-91.
- (68) Spang, E.S., Moomaw, W.R., Gallagher, K.S., Kirshen, P.H., Marks, D.H. The water consumption of energy production: an international comparison. *Environ Res Lett.* 2014,9.
- (69) Peer, R.A.M., Sanders, K.T. The water consequences of a transitioning US power sector. *Appl Energy.* 2018,210,613-22.
- (70) Srinivasan, S., Kholod, N., Chaturvedi, V., Ghosh, P.P., Mathur, R., Clarke, L., Evans, M., Hejazi, M., Kanudia, A., Koti, P.N., Liu, B., Parikh, K.S., Ali, M.S., Sharma, K. Water for electricity in India: A multi-model study of future challenges and linkages to climate change mitigation. *Appl Energy.* 2018,210,673-84.
- (71) Fulton, J., Cooley, H. The water footprint of California's energy system, 1990-2012. *Environ Sci Technol.* 2015,49,3314-21.
- (72) Dodder, R.S., Barnwell, J.T., Yelverton, W.H. Scenarios for Low Carbon and Low Water Electric Power Plant Operations: Implications for Upstream Water Use. *Environ Sci Technol.* 2016,50,11460-70.
- (73) Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L.A., Group, P.-P. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev.* 2015,4,1.
- (74) Pfister, S., Boulay, A.-M., Berger, M., Hadjikakou, M., Motoshita, M., Hess, T., Ridoutt, B., Weinzettel, J., Scherer, L., Döll, P., Manzardo, A., Núñez, M., Verones, F., Humbert, S., Buxmann, K., Harding, K., Benini, L., Oki, T., Finkbeiner, M., Henderson, A. Understanding the LCA and ISO water footprint: A response to Hoekstra (2016) "A critique on the water-scarcity weighted water footprint in LCA". *Ecol Indic.* 2017,72,352-9.
- (75) Ali, B., Kumar, A. Development of water demand coefficients for power generation from renewable energy technologies. *Energy Convers Manag.* 2017,143,470-81.
- (76) Carrillo, A.M.R., Frei, C. Water: A key resource in energy production. *Energy Policy.* 2009,37,4303-12.
- (77) Liao, X.W., Hall, J.W., Eyre, N. Water use in China's thermoelectric power sector. *Glob Environ Change.* 2016,41,142-52.

References

- (78) Tursi, A. A review on biomass: importance, chemistry, classification, and conversion. *Biofuel Research Journal*. 2019,6,962-79.
- (79) Cai, B., Zhang, B., Bi, J., Zhang, W. Energy's thirst for water in China. *Environ Sci Technol*. 2014,48,11760-8.
- (80) Eyer, J., Wichman, C.J. Does water scarcity shift the electricity generation mix toward fossil fuels? Empirical evidence from the United States. *J Environ Econ Manag*. 2018,87,224-41.
- (81) Gerbens-Leenes, P.W., Hoekstra, A.Y., van der Meer, T. The water footprint of energy from biomass: A quantitative assessment and consequences of an increasing share of bio-energy in energy supply. *Ecol Econ*. 2009,68,1052-60.
- (82) Xin, L., Feng, K., Siu, Y.L., Hubacek, K. Challenges faced when energy meets water: CO₂ and water implications of power generation in inner Mongolia of China. *Renew Sustain Energy Rev*. 2015,45,419-30.
- (83) Feng, K., Hubacek, K., Siu, Y.L., Li, X. The energy and water nexus in Chinese electricity production: A hybrid life cycle analysis. *Renew Sustain Energy Rev*. 2014,39,342-55.
- (84) Clark, C.E., Harto, C.B., Schroeder, J.N., Martino, L.E., Horner, R.M. Life Cycle Water Consumption and Water Resource Assessment for Utility-Scale Geothermal Systems: An In-Depth Analysis of Historical and Forthcoming EGS Projects. United States: U. S. Department of Energy; 2013.
- (85) Singh, S., Kumar, A. Development of water requirement factors for biomass conversion pathway. *Bioresour Technol*. 2011,102,1316-28.
- (86) Dominguez-Faus, R., Powers, S.E., Burken, J.G., Alvarez, P.J. The Water Footprint of Biofuels: A Drink or Drive Issue. *Environ Sci Technol*. 2009,43,3005–10.
- (87) Gerbens-Leenes, W., Hoekstra, A.Y. The water footprint of biofuel-based transport. *Energy Environ Sci*. 2011,4,2658-68.
- (88) Mann, M.K., Spath, P.L. Life Cycle Assessment of a Biomass Gasification Combined-Cycle System. U. S.: National Renewable Energy Laboratory; 1997.
- (89) Chang, Y., Huang, R.Z., Ries, R.J., Masanet, E. Life-cycle comparison of greenhouse gas emissions and water consumption for coal and shale gas fired power generation in China. *Energy*. 2015,86,335-43.
- (90) Ali, B., Kumar, A. Development of life cycle water-demand coefficients for coal-based power generation technologies. *Energy Convers Manag*. 2015,90,247-

60.

(91) Ou, Y., Zhai, H.B., Rubin, E.S. Life cycle water use of coal- and natural-gas-fired power plants with and without carbon capture and storage. *Int J Greenh Gas Con.* 2016,44,249-61.

(92) Ali, B., Kumar, A. Development of life cycle water footprints for gas-fired power generation technologies. *Energy Convers Manag.* 2016,110,386-96.

(93) Poinssot, C., Bourg, S., Ouvrier, N., Combernoux, N., Rostaing, C., Vargas-Gonzalez, M., Bruno, J. Assessment of the environmental footprint of nuclear energy systems. Comparison between closed and open fuel cycles. *Energy.* 2014,69,199-211.

(94) Demeke, T.A., Marence, M., Mynett, A.E. Evaporation from reservoirs and the hydropower water footprint. International Conference and Exhibition on Water Storage and Hydropower Development for Africa. Ethiopia2013.

(95) Liu, J.G., Zhao, D.D., Gerbens-Leenes, P.W., Guan, D.B. China's rising hydropower demand challenges water sector. *Sci Rep.* 2015,5.

(96) Bakken, T.H., Modahl, I.S., Engeland, K., Raadal, H.L., Arnoy, S. The life-cycle water footprint of two hydropower projects in Norway. *J Clean Prod.* 2016,113,241-50.

(97) Herath, I., Deurer, M., Horne, D., Singh, R., Clothier, B. The water footprint of hydroelectricity: a methodological comparison from a case study in New Zealand. *J Clean Prod.* 2011,19,1582-9.

(98) Yuan, X., Lu, Y., Bi, X.J., Yuan, C., He, K.W., Dun, Y. A New Water Footprint Calculation Method for Hydroelectricity.(in Chinese). *China Rural Water Hydropower.* 2018,165-8.

(99) Peer, R.A.M., Sanders, K.T. Characterizing cooling water source and usage patterns across US thermoelectric power plants: a comprehensive assessment of self-reported cooling water data. *Environ Res Lett.* 2016,11,124030.

(100) Gao, J.J., Zhao, P., Zhang, H.W., Mao, G.Z., Wang, Y. Operational Water Withdrawal and Consumption Factors for Electricity Generation Technology in China-A Literature Review. *Sustainability.* 2018,10.

(101) Grubert, E.A., Beach, F.C., Webber, M.E. Can switching fuels save water? A life cycle quantification of freshwater consumption for Texas coal- and natural gas-fired electricity. *Environ Res Lett.* 2012,7.

(102) Williams, E.D., E., S.J. <BP-ESC-water-handbook.pdf>. BP International

Ltd; 2013.

- (103) Diehl, T.H., Harris, M.A. Withdrawal and Consumption of Water by Thermoelectric Power Plants in the United States, 2010. U.S. Geological Survey; 2014.
- (104) Bukhary, S., Ahmad, S., Batista, J. Analyzing land and water requirements for solar deployment in the Southwestern United States. *Renew Sustain Energy Rev.* 2018,82,3288-305.
- (105) Stillwell, A.S., King, C.W., Webber, M.E., Duncan, I.J., Hardberger, A. Energy-Water Nexus in Texas. United States: The University of Texas at Austin; 2009.
- (106) Mishra, G.S., Glassley, W.E., Yeh, S. Realizing the geothermal electricity potential-water use and consequences. *Environ Res Lett.* 2011,6.
- (107) Wu, X.D., Ji, X., Li, C., Xia, X.H., Chen, G.Q. Water footprint of thermal power in China: Implications from the high amount of industrial water use by plant infrastructure of coal-fired generation system. *Energy Policy.* 2019,132,452-61.
- (108) Byers, E.A., Hall, J.W., Amezcaga, J.M. Electricity generation and cooling water use: UK pathways to 2050. *Global Environmental Change.* 2014,25,16-30.
- (109) Ali, B. The cost of conserved water for coal power generation with carbon capture and storage in Alberta, Canada. *Energy Convers Manag.* 2018,158,387-99.
- (110) Talati, S., Zhai, H.B., Kyle, G.P., Morgan, M.G., Patel, P., Liu, L. Consumptive Water Use from Electricity Generation in the Southwest under Alternative Climate, Technology, and Policy Futures. *Environ Sci Technol.* 2016,50,12095-104.
- (111) Sharma, N., Mahapatra, S.S. A preliminary analysis of increase in water use with carbon capture and storage for Indian coal-fired power plants. *Environmental Technology & Innovation.* 2018,9,51-62.
- (112) Chandel, M.K., Pratson, L.F., Jackson, R.B. The potential impacts of climate-change policy on freshwater use in thermoelectric power generation. *Energy Policy.* 2011,39,6234-42.
- (113) Smith, P., Davis, S.J., Creutzig, F., Fuss, S., Minx, J., Gabrielle, B., Kato, E., Jackson, R.B., Cowie, A., Kriegler, E., van Vuuren, D.P., Rogelj, J., Ciais, P., Milne, J., Canadell, J.G., McCollum, D., Peters, G., Andrew, R., Krey, V., Shrestha, G., Friedlingstein, P., Gasser, T., Grubler, A., Heidug, W.K., Jonas, M., Jones, C.D., Kraxner, F., Littleton, E., Lowe, J., Moreira, J.R., Nakicenovic, N., Obersteiner, M., Patwardhan, A., Rogner, M., Rubin, E., Sharifi, A., Torvanger, A., Yamagata, Y.,

- Edmonds, J., Yongsung, C. Biophysical and economic limits to negative CO₂ emissions. *Nat Clim Change*. 2015,6,42.
- (114) Ren, K., Tang, X., Jin, Y., Wang, J., Feng, C., Höök, M. Bi-objective optimization of water management in shale gas exploration with uncertainty: A case study from Sichuan, China. *Resour Conserv Recycl*. 2019,143,226-35.
- (115) Guo, M., Lu, X., Nielsen, C.P., McElroy, M.B., Shi, W., Chen, Y., Xu, Y. Prospects for shale gas production in China: Implications for water demand. *Renew Sustain Energy Rev*. 2016,66,742-50.
- (116) Clark, C.E., Horner, R.M., Harto, C.B. Life cycle water consumption for shale gas and conventional natural gas. *Environ Sci Technol*. 2013,47,11829-36.
- (117) U.S. Energy Information Administration. Shale gas production. https://www.eia.gov/dnav/ng/ng_prod_shalegas_s1_a.htm; 2018, Accessed date: 20 May 2019.
- (118) Liao, X., Chai, L., Jiang, Y., Ji, J., Zhao, X. Inter-provincial electricity transmissions' co-benefit of national water savings in China. *J Clean Prod*. 2019,229,350-7.
- (119) Ehtiawesh, I.A.S., Da Silva, F.N., Sousa, A.C.M. Deployment of parabolic trough concentrated solar power plants in North Africa - a case study for Libya. *International Journal of Green Energy*. 2019,16,72-85.
- (120) U.S. Energy Information Administration. Utility scale facility net generation from solar thermal. https://www.eia.gov/electricity/annual/html/epa_03_22.html. 2018.
- (121) Wu, Z.Y., Hou, A.P., Chang, C., Huang, X., Shi, D.Q., Wang, Z.F. Environmental impacts of large-scale CSP plants in northwestern China. *Environmental Science-Processes & Impacts*. 2014,16,2432-41.
- (122) The World Bank Group. Direct normal irradiation. <https://globalsolaratlas.info/downloads/china>; 2017, Accessed date: 23 May 2019.
- (123) International Energy Agency. Water-Energy Nexus. 2017.
- (124) McMahon, J.E., Price, S.K. Water and Energy Interactions. *Annu Rev Environ Resour*. 2011,36,163-91.
- (125) Guo, Y., Cao, Y.Q., Xian, T., Zhang, C.R. Brief analysis on water consumption index of inland nuclear power station. *Water Resour Hydropower Eng*. 2012,43,119-22.
- (126) The food and agriculture organization. Country codes/names

<http://www.fao.org/countryprofiles/iso3list/en/>; 2019, Accessed date: 22 May 2019.

- (127) Li, L., Shan, Y., Lei, Y., Wu, S., Yu, X., Lin, X., Chen, Y. Decoupling of economic growth and emissions in China's cities: A case study of the Central Plains urban agglomeration. *Appl Energy*. 2019,244,36-45.
- (128) Xie, P., Yang, F., Mu, Z., Gao, S. Influencing factors of the decoupling relationship between CO₂ emission and economic development in China's power industry. *Energy*. 2020,209,118341.
- (129) Chen, J., Wang, P., Cui, L., Huang, S., Song, M. Decomposition and decoupling analysis of CO₂ emissions in OECD. *Appl Energy*. 2018,231,937-50.
- (130) Scherer, L., de Koning, A., Tukker, A. BRIC and MINT countries' environmental impacts rising despite alleviative consumption patterns. *Sci Total Environ*. 2019,665,52-60.
- (131) Liao, X.W., Zhao, X., Hall, J.W., Guan, D.B. Categorising virtual water transfers through China's electric power sector. *Appl Energy*. 2018,226,252-60.
- (132) Yang, J., Chen, B. Energy-water nexus of wind power generation systems. *Appl Energy*. 2016,169,1-13.
- (133) Coelho, C.D., da Silva, D.D., Sediyaama, G.C., Moreira, M.C., Pereira, S.B., Lana, A.M.Q. Comparison of the water footprint of two hydropower plants in the Tocantins River Basin of Brazil. *J Clean Prod*. 2017,153,164-75.
- (134) World Nuclear Association. Cooling power plants. 2019.
- (135) Xu, X.H., Vignarooban, K., Xu, B., Hsu, K., Kannan, A.M. Prospects and problems of concentrating solar power technologies for power generation in the desert regions. *Renew Sustain Energy Rev*. 2016,53,1106-31.
- (136) Zhai, H., Rubin, E.S., Versteeg, P.L. Water use at pulverized coal power plants with postcombustion carbon capture and storage. *Environ Sci Technol*. 2011,45,2479-85.
- (137) Bosnjakovic, M., Tadijanovic, V. ENVIRONMENT IMPACT OF A CONCENTRATED SOLAR POWER PLANT. *Tehnicki Glasnik-Technical Journal*. 2019,13,68-74.
- (138) Zhai, H., Rubin, E.S. Performance and cost of wet and dry cooling systems for pulverized coal power plants with and without carbon capture and storage. *Energy Policy*. 2010,38,5653-60.
- (139) Zhang, C., Anadon, L.D., Mo, H.P., Zhao, Z.N., Liu, Z. Water-Carbon Trade-

- off in China's Coal Power Industry. *Environ Sci Technol*. 2014,48,11082-9.
- (140) Hogeboom, R.J., Knook, L., Hoekstra, A.Y. The blue water footprint of the world's artificial reservoirs for hydroelectricity, irrigation, residential and industrial water supply, flood protection, fishing and recreation. *Adv in Water Resour*. 2018,113,285-94.
- (141) Zhao, D.D., Liu, J.G. A new approach to assessing the water footprint of hydroelectric power based on allocation of water footprints among reservoir ecosystem services. *Phys Chem Earth*. 2015,79-82,40-6.
- (142) Mekonnen, M.M., Hoekstra, A.Y. The blue water footprint of electricity from hydropower. *Hydrol Earth Syst Sci*. 2012,16,179-87.
- (143) Xie, X., Jiang, X., Zhang, T., Huang, Z. Regional water footprints assessment for hydroelectricity generation in China. *Renew Energy*. 2019,138,316-25.
- (144) Lu, Y., He, D.M., He, K.W., Yuan, X. Analysis and calculation of water consumption of hydropower plants in Lancang-Mekong River basin.(in Chinese). *Adv Water Sci*. 2018,29,415-23.
- (145) Ding, X., Tian, W., Chen, Q., Wei, G. Policies on water resources assessment of coastal nuclear power plants in China. *Energy Policy*. 2019,128,170-8.
- (146) Operating Experience with Nuclear Power Stations in Member States. 2018.
- (147) Crawford, R.H., Bontinck, P.-A., Stephan, A., Wiedmann, T., Yu, M. Hybrid life cycle inventory methods – A review. *J Clean Prod*. 2018,172,1273-88.
- (148) Wolfram, P., Wiedmann, T., Diesendorf, M. Carbon footprint scenarios for renewable electricity in Australia. *J Clean Prod*. 2016,124,236-45.
- (149) Lenzen, M. A guide for compiling inventories in hybrid life-cycle assessments: some Australian results. *J Clean Prod*. 2002,10,545-72.
- (150) Suh, S. Functions, commodities and environmental impacts in an ecological-economic model. *Ecol Econ*. 2004,48,451-67.
- (151) Joshi, S. Product Environmental Life-Cycle Assessment Using Input-Output Techniques. *J Ind Ecol*. 1999,3,95-120.
- (152) Finnveden, G., Hauschild, M.Z., Ekvall, T., Guinée, J., Heijungs, R., Hellweg, S., Koehler, A., Pennington, D., Suh, S. Recent developments in Life Cycle Assessment. *J Environ Manag*. 2009,91,1-21.
- (153) Hertwich, E.G., Gibon, T., Bouman, E.A., Arvesen, A., Suh, S., Heath, G.A., Bergesen, J.D., Ramirez, A., Vega, M.I., Shi, L. Integrated life-cycle assessment of

- electricity-supply scenarios confirms global environmental benefit of low-carbon technologies. *Proc Natl Acad Sci USA*. 2015,112,6277-82.
- (154) Zafrilla, J.E., Cadarso, M.-Á., Monsalve, F., de la Rúa, C. How Carbon-Friendly Is Nuclear Energy? A Hybrid MRIO-LCA Model of a Spanish Facility. *Environ Sci Technol*. 2014,48,14103-11.
- (155) Bush, R., Jacques, D.A., Scott, K., Barrett, J. The carbon payback of micro-generation: An integrated hybrid input-output approach. *Appl Energy*. 2014,119,85-98.
- (156) Wiedmann, T.O., Suh, S., Feng, K., Lenzen, M., Acquaye, A., Scott, K., Barrett, J.R. Application of Hybrid Life Cycle Approaches to Emerging Energy Technologies-The Case of Wind Power in the UK. *Environ Sci Technol*. 2011,45,5900-7.
- (157) Suh, S., Huppes, G. Methods for Life Cycle Inventory of a product. *J Clean Prod*. 2005,13,687-97.
- (158) Wu, X.D., Chen, G.Q. Energy and water nexus in power generation: The surprisingly high amount of industrial water use induced by solar power infrastructure in China. *Appl Energy*. 2017,195,125-36.
- (159) Gu, A., Teng, F., Lv, Z. Exploring the nexus between water saving and energy conservation: Insights from industry sector during the 12th Five-Year Plan period in China. *Renew Sustain Energy Rev*. 2016,59,28-38.
- (160) Tang, X., Jin, Y., Feng, C., McLellan, B.C. Optimizing the energy and water conservation synergy in China: 2007–2012. *J Clean Prod*. 2018,175,8-17.
- (161) Li, X., Feng, K.S., Siu, Y.L., Hubacek, K. Energy-water nexus of wind power in China: The balancing act between CO₂ emissions and water consumption. *Energy Policy*. 2012,45,440-8.
- (162) Weber, C.L., Jaramillo, P., Marriott, J., Samaras, C. Life Cycle Assessment and Grid Electricity: What Do We Know and What Can We Know? *Environ Sci Technol*. 2010,44,1895-901.
- (163) Bakken, T.H., Killingtveit, Å., Engeland, K., Alfredsen, K., Harby, A. Water consumption from hydropower plants – review of published estimates and an assessment of the concept. *Hydrol Earth Syst Sci*. 2013,17,3983-4000.
- (164) Bakken, T.H., Modahl, I.S., Raadal, H.L., Bustos, A.A., Arnoy, S. Allocation of water consumption in multipurpose reservoirs. *Water Policy*. 2016,18,932-47.
- (165) Mathioudakis, V., Gerbens-Leenes, P.W., Van der Meer, T.H., Hoekstra, A.Y.

- The water footprint of second-generation bioenergy: A comparison of biomass feedstocks and conversion techniques. *J Clean Prod.* 2017,148,571-82.
- (166) Pfister, S., Scherer, L. Uncertainty analysis of the environmental sustainability of biofuels. *Energy, Sustainability and Society.* 2015,5,30.
- (167) Zhang, C., Zhong, L.J., Fu, X.T., Zhao, Z.N. Managing Scarce Water Resources in China's Coal Power Industry. *Environ Manag.* 2016,57,1188-203.
- (168) Zhang, C., Zhong, L., Fu, X., Wang, J., Wu, Z. Revealing Water Stress by the Thermal Power Industry in China Based on a High Spatial Resolution Water Withdrawal and Consumption Inventory. *Environ Sci Technol.* 2016,50,1642-52.
- (169) Ma, X.T., Yang, D.L., Shen, X.X., Zhai, Y.J., Zhang, R.R., Hong, J.L. How much water is required for coal power generation: An analysis of gray and blue water footprints. *Sci Total Environ.* 2018,636,547-57.
- (170) The Water footprint assessment manual: Setting the global standard. 2011.
- (171) Gao, X., Zhao, Y., Lu, S., Chen, Q., An, T., Han, X., Zhuo, L. Impact of coal power production on sustainable water resources management in the coal-fired power energy bases of Northern China. *Appl Energy.* 2019,250,821-33.
- (172) Zhang, C., Zhong, L., Liang, S., Sanders, K.T., Wang, J., Xu, M. Virtual scarce water embodied in inter-provincial electricity transmission in China. *Appl Energy.* 2017,187,438-48.
- (173) Mertens, J., Prieur-Vernat, A., Corbisier, D., Favrot, E., Boon, G. Water footprinting of electricity generated by combined cycle gas turbines using different cooling technologies: a practitioner's experience. *J Clean Prod.* 2015,86,201-8.
- (174) Hoekstra, A.Y., Mekonnen, M.M., Chapagain, A.K., Mathews, R.E., Richter, B.D. Global Monthly Water Scarcity: Blue Water Footprints versus Blue Water Availability. *PLoS One.* 2012,7,e32688.
- (175) Pfister, S., Koehler, A., Hellweg, S. Assessing the Environmental Impacts of Freshwater Consumption in LCA. *Environ Sci Technol.* 2009,43,4098-104.
- (176) Boulay, A.-M., Bulle, C., Bayart, J.-B., Deschênes, L., Margni, M. Regional Characterization of Freshwater Use in LCA: Modeling Direct Impacts on Human Health. *Environ Sci Technol.* 2011,45,8948-57.
- (177) Boulay, A.-M., Bare, J., Benini, L., Berger, M., Lathuillière, M.J., Manzardo, A., Margni, M., Motoshita, M., Núñez, M., Pastor, A.V., Ridoutt, B., Oki, T., Worbe, S., Pfister, S. The WULCA consensus characterization model for water scarcity footprints: assessing impacts of water consumption based on available

- water remaining (AWARE). *Int J Life Cycle Ass.* 2018,23,368-78.
- (178) U.S. Energy Information Administration. Electric power annual. <https://www.eia.gov/electricity/annual/>; 2018, Accessed date: 29 May 2019.
- (179) Nouri, N., Balali, F., Nasiri, A., Seifoddini, H., Otieno, W. Water withdrawal and consumption reduction for electrical energy generation systems. *Appl Energy.* 2019,248,196-206.
- (180) Sood, A., Smakhtin, V. Global hydrological models: a review. *Hydrological Sciences Journal.* 2015,60,549-65.
- (181) Li, X., Liu, J., Zheng, C., Han, G., Hoff, H. Energy for water utilization in China and policy implications for integrated planning. *International Journal of Water Resources Development.* 2016,32,477-94.
- (182) Qin, Y., Curmi, E., Kopec, G.M., Allwood, J.M., Richards, K.S. China's energy-water nexus – assessment of the energy sector's compliance with the “3 Red Lines” industrial water policy. *Energy Policy.* 2015,82,131-43.
- (183) Lu, Y., Jenkins, A., Ferrier, R.C., Bailey, M., Gordon, I.J., Song, S., Huang, J., Jia, S., Zhang, F., Liu, X., Feng, Z., Zhang, Z. Addressing China’s grand challenge of achieving food security while ensuring environmental sustainability. *Sci Adv.* 2015,1,e1400039.
- (184) Aghbashlo, M., Tabatabaei, M., Soltanian, S., Ghanavati, H. Biopower and biofertilizer production from organic municipal solid waste: An exergoenvironmental analysis. *Renew Energy.* 2019,143,64-76.
- (185) Rocha, D.H.D., Silva, R.J. Exergoenvironmental analysis of a ultra-supercritical coal-fired power plant. *J Clean Prod.* 2019,231,671-82.
- (186) Aghbashlo, M., Tabatabaei, M., Soltanian, S., Ghanavati, H., Dadak, A. Comprehensive exergoeconomic analysis of a municipal solid waste digestion plant equipped with a biogas genset. *Waste Manag.* 2019,87,485-98.
- (187) Wang, J., Li, S., Zhang, G., Yang, Y. Performance investigation of a solar-assisted hybrid combined cooling, heating and power system based on energy, exergy, exergo-economic and exergo-environmental analyses. *Energy Conversion and Management.* 2019,196,227-41.
- (188) Rosen, M.A. Environmental sustainability tools in the biofuel industry. *Biofuel Research Journal.* 2018,5,751-2.
- (189) van Vliet, M.T.H., Flörke, M., Wada, Y. Quality matters for water scarcity. *Nat Geosci.* 2017,10,800.

References

- (190) Li, D., Zhao, J., Govindaraju, R.S. Water benefits sharing under transboundary cooperation in the Lancang-Mekong River Basin. *J Hydrol.* 2019,577,123989.
- (191) Xu, R., Hu, H., Tian, F., Li, C., Khan, M.Y.A. Projected climate change impacts on future streamflow of the Yarlung Tsangpo-Brahmaputra River. *Global Planet Change.* 2019,175,144-59.
- (192) Center for Strategic Studies of CNA. Water Resource Competition in the Brahmaputra River Basin: China, India, and Bangladesh. 2016.
- (193) Yang, Y.C.E., Wi, S., Ray, P.A., Brown, C.M., Khalil, A.F. The future nexus of the Brahmaputra River Basin: Climate, water, energy and food trajectories. *Global Environmental Change.* 2016,37,16-30.
- (194) The CPC Central Committee's proposals for formulating the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and the Long-Range Objectives Through the Year 2035. 2020.
- (195) Rosa, L., Reimer, J.A., Went, M.S., D'Odorico, P. Hydrological limits to carbon capture and storage. *Nature Sustainability.* 2020.
- (196) Mallapaty, S. How China could be carbon neutral by mid-century. *Nature.* 2020,482-3.
- (197) Lee, U., Han, J., Elgowainy, A., Wang, M. Regional water consumption for hydro and thermal electricity generation in the United States. *Appl Energy.* 2018,210,661-72.
- (198) Macknick, J., Newmark, R., Heath, G., Hallett, K.C. Operational water consumption and withdrawal factors for electricity generating technologies: a review of existing literature. *Environ Res Lett.* 2012,7,045802.
- (199) Hofste, R., S. , Kuzma, S.W., Sutanudjaja, E.H. AQUEDUCT 3.0: UPDATED DECISION-RELEVANT GLOBAL WATER RISK INDICATORS. World Resources Institute. 2019.
- (200) Zhang, X., Liu, J., Tang, Y., Zhao, X., Yang, H., Gerbens-Leenes, P.W., van Vliet, M.T.H., Yan, J. China's coal-fired power plants impose pressure on water resources. *J Clean Prod.* 2017,161,1171-9.
- (201) National Bureau of Statistics of China. Water Supply and Water Use. 2019.
- (202) Liao, X., Zhao, X., Hall, J.W., Guan, D. Categorising virtual water transfers through China's electric power sector. *Appl Energy.* 2018,226,252-60.
- (203) Bakken, T.H., Killingtveit, Å., Alfredsen, K. The Water Footprint of

- Hydropower Production—State of the Art and Methodological Challenges. *Global Challenges*. 2017,1,1600018.
- (204) Liu, J., Zhao, D., Gerbens-Leenes, P.W., Guan, D. China's rising hydropower demand challenges water sector. *Sci Rep*. 2015,5,11446.
- (205) Zhu, X., Guo, R., Chen, B., Zhang, J., Hayat, T., Alsaedi, A. Embodiment of virtual water of power generation in the electric power system in China. *Appl Energy*. 2015,151,345-54.
- (206) Wang, C., Wang, R., Hertwich, E., Liu, Y., Tong, F. Water scarcity risks mitigated or aggravated by the inter-regional electricity transmission across China. *Appl Energy*. 2019,238,413-22.
- (207) He, G., Zhao, Y., Jiang, S., Zhu, Y., Li, H., Wang, L. Impact of virtual water transfer among electric sub-grids on China's water sustainable developments in 2016, 2030, and 2050. *Journal of Cleaner Production*. 2019,239,118056.
- (208) Zhang, C., He, G., Zhang, Q., Liang, S., Zipper, S.C., Guo, R., Zhao, X., Zhong, L., Wang, J. The evolution of virtual water flows in China's electricity transmission network and its driving forces. *Journal of Cleaner Production*. 2020,242,118336.
- (209) Zhang, Y., Hou, S., Chen, S., Long, H., Liu, J., Wang, J. Tracking flows and network dynamics of virtual water in electricity transmission across China. *Renewable and Sustainable Energy Reviews*. 2020,110475.
- (210) Zhu, Y., Ke, J., Wang, J., Liu, H., Jiang, S., Blum, H., Zhao, Y., He, G., Meng, Y., Su, J. Water transfer and losses embodied in the West–East electricity transmission project in China. *Appl Energy*. 2020,275,115152.
- (211) Guo, R., Zhu, X., Chen, B., Yue, Y. Ecological network analysis of the virtual water network within China's electric power system during 2007–2012. *Appl Energy*. 2016,168,110-21.
- (212) Liao, X., Zhao, X., Liu, W., Li, R., Wang, X., Wang, W., Tillotson, M.R. Comparing water footprint and water scarcity footprint of energy demand in China's six megacities. *Appl Energy*. 2020,269,115137.
- (213) Zhang, Y., Fang, J., Wang, S., Yao, H. Energy-water nexus in electricity trade network: A case study of interprovincial electricity trade in China. *Appl Energy*. 2020,257,113685.
- (214) Zhang, Y., Wang, J., Zhang, L., Liu, J., Zheng, H., Fang, J., Hou, S., Chen, S. Optimization of China's electric power sector targeting water stress and carbon emissions. *Appl Energy*. 2020,271,115221.

- (215) Platts Energy InfoStore Utility Data Institute. World Electric Power Plants Database. 2018.
- (216) Lehner, B., Liermann, C.R., Revenga, C., Vörösmarty, C., Fekete, B., Crouzet, P., Döll, P., Endejan, M., Frenken, K., Magome, J., Nilsson, C., Robertson, J.C., Rödel, R., Sindorf, N., Wisser, D. High-resolution mapping of the world's reservoirs and dams for sustainable river-flow management. *Frontiers in Ecology and the Environment*. 2011,9,494-502.
- (217) China Electricity Council. Materials of national energy efficiency benchmarking competition for thermal power units. 2018.
- (218) National Bureau of Statistics of China. Regional power production. 2019.
- (219) Editorial Board of China Power Yearbook. China Electric Power Yearbook. 2008-2018.
- (220) Qu, S., Liang, S., Xu, M. CO₂ Emissions Embodied in Interprovincial Electricity Transmissions in China. *Environ Sci Technol*. 2017,51,10893-902.
- (221) Professional Knowledge Service System for Energy. Inter-provincial power transmission. 2019.
- (222) China Electricity Council. Power Industry Statistical Information System. 2019.
- (223) EARTHDATA. FLDAS Noah Land Surface Model L4 Global Monthly Anomaly 0.1 x 0.1 degree. 2017.
- (224) Gassert, F., Luck, M., Landis, M., Reig, P., Shiao, T. Aqueduct Global Maps 2.1: Constructing Decision-Relevant Global Water Risk Indicators. Washington D.C. United States.: World Resources Institute; 2014.
- (225) Ministry of Water Resources of the People's Republic of China. Water Resources Bulletin of China in 2020. 2021.
- (226) Cai, B., Zhang, W., Hubacek, K., Feng, K., Li, Z., Liu, Y., Liu, Y. Drivers of virtual water flows on regional water scarcity in China. *J Clean Prod*. 2019,207,1112-22.
- (227) Scherer, L., Pfister, S. Dealing with uncertainty in water scarcity footprints. *Environ Res Lett*. 2016,11,054008.
- (228) Huang, J., Ridoutt, B.G., Sun, Z., Lan, K., Thorp, K.R., Wang, X., Yin, X., Huang, J., Chen, F., Scherer, L. Balancing food production within the planetary water boundary. *Journal of Cleaner Production*. 2020,253,119900.

- (229) Pfister, S., Bayer, P. Monthly water stress: spatially and temporally explicit consumptive water footprint of global crop production. *Journal of Cleaner Production*. 2014,73,52-62.
- (230) Zhou, F., Bo, Y., Ciais, P., Dumas, P., Tang, Q., Wang, X., Liu, J., Zheng, C., Polcher, J., Yin, Z., Guimberteau, M., Peng, S., Ottle, C., Zhao, X., Zhao, J., Tan, Q., Chen, L., Shen, H., Yang, H., Piao, S., Wang, H., Wada, Y. Deceleration of China's human water use and its key drivers. 2020,117,7702-11.
- (231) National Development and Reform Commission. Requirements on the Planning and Construction of Coal Power Plants. 2004.
- (232) National Energy Administration. Introduction to the grid-connected operation of renewable energy in 2018. 2019.
- (233) Sharifzadeh, M., Hien, R.K.T., Shah, N. China's roadmap to low-carbon electricity and water: Disentangling greenhouse gas (GHG) emissions from electricity-water nexus via renewable wind and solar power generation, and carbon capture and storage. *Appl Energy*. 2019,235,31-42.
- (234) China Electricity Council. Benchmarking management of energy efficiency of thermal power plants and benchmarking of energy efficiency of thermal power units. 2019.
- (235) National Energy Administration. List of Twelve Electricity Transmission Corridors for Air Pollution Control to Be Approved by the National Energy Administration. 2014.
- (236) Peng, W., Yuan, J.H., Zhao, Y., Lin, M.Y., Zhang, Q., Victor, D.G., Mauzerall, D.L. Air quality and climate benefits of long-distance electricity transmission in China. *Environ Res Lett*. 2017,12,10.
- (237) Ministry of Natural Resources. National Seawater Utilization Report. 2020.
- (238) Department of Energy. Transforming the Nation's Electricity System: The Second Installment of the Quadrennial Energy Review. 2017.
- (239) EUREAU. EUREAU Statistics Overview on Water and Wastewater in Europe. 2009.
- (240) Vassolo, S., Döll, P. Global-scale gridded estimates of thermoelectric power and manufacturing water use. *Water Resources Research*. 2005,41.
- (241) van Vliet, M.T.H., Yearsley, J.R., Ludwig, F., Vögele, S., Lettenmaier, D.P., Kabat, P. Vulnerability of US and European electricity supply to climate change. *Nature Climate Change*. 2012,2,676.

- (242) Peer, R.A.M., Grubert, E., Sanders, K.T. A regional assessment of the water embedded in the US electricity system. *Environ Res Lett.* 2019,14,084014.
- (243) Standardization Administration. Environmental quality standards for surface water. 2002.
- (244) Chabouni, N., Belarbi, Y., Benhassine, W. Electricity load dynamics, temperature and seasonality Nexus in Algeria. *Energy.* 2020,200,117513.
- (245) Conevska, A., Urpelainen, J. Weathering electricity demand? Seasonal variation in electricity consumption among off-grid households in rural India. *Energy Res Social Sci.* 2020,65,101444.
- (246) Do, L.P.C., Lin, K.-H., Molnár, P. Electricity consumption modelling: A case of Germany. *Economic Modelling.* 2016,55,92-101.
- (247) Ferraz de Andrade Santos, J.A., de Jong, P., Alves da Costa, C., Torres, E.A. Combining wind and solar energy sources: Potential for hybrid power generation in Brazil. *Utilities Policy.* 2020,67,101084.
- (248) Zhang, Q., Chen, W. Modeling China's interprovincial electricity transmission under low carbon transition. *Applied Energy.* 2020,279,115571.
- (249) China electric power yearbook. 2018.
- (250) Lèbre, É., Stringer, M., Svobodova, K., Owen, J.R., Kemp, D., Côte, C., Arratia-Solar, A., Valenta, R.K. The social and environmental complexities of extracting energy transition metals. *Nat Commun.* 2020,11,4823.
- (251) Popescu, V.D., Munshaw, R.G., Shackelford, N., Montesino Pouzols, F., Dubman, E., Gibeau, P., Horne, M., Moilanen, A., Palen, W.J. Quantifying biodiversity trade-offs in the face of widespread renewable and unconventional energy development. *Scientific Reports.* 2020,10,7603.
- (252) Wang, J., Zhong, H., Yang, Z., Wang, M., Kammen, D.M., Liu, Z., Ma, Z., Xia, Q., Kang, C. Exploring the trade-offs between electric heating policy and carbon mitigation in China. *Nat Commun.* 2020,11,6054.
- (253) Mason, N., Ward, M., Watson, J.E.M., Venter, O., Runting, R.K. Global opportunities and challenges for transboundary conservation. *Nat Ecol Evol.* 2020,4,694-701.
- (254) Harrison, P.A., Berry, P.M., Simpson, G., Haslett, J.R., Blicharska, M., Bucur, M., Dunford, R., Egoh, B., Garcia-Llorente, M., Geamănă, N., Geertsema, W., Lommelen, E., Meiresonne, L., Turkelboom, F. Linkages between biodiversity attributes and ecosystem services: A systematic review. *Ecosyst Serv.* 2014,9,191-

203.

(255) Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., Geschke, A. International trade drives biodiversity threats in developing nations. *Nature*. 2012,486,109.

(256) Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., Bennett, E.M., Biggs, R., Carpenter, S.R., de Vries, W., de Wit, C.A., Folke, C., Gerten, D., Heinke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B., Sörlin, S. Planetary boundaries: Guiding human development on a changing planet. *Science*. 2015,347,1259855.

(257) Holland, R.A., Scott, K.A., Flörke, M., Brown, G., Ewers, R.M., Farmer, E., Kapos, V., Muggeridge, A., Scharlemann, J.P.W., Taylor, G., Barrett, J., Eigenbrod, F. Global impacts of energy demand on the freshwater resources of nations. *Proc Natl Acad Sci U S A*. 2015,112,E6707.

(258) Vörösmarty, C.J., Rodríguez Osuna, V., Cak, A.D., Bhaduri, A., Bunn, S.E., Corsi, F., Gastelumendi, J., Green, P., Harrison, I., Lawford, R., Marcotullio, P.J., McClain, M., McDonald, R., McIntyre, P., Palmer, M., Robarts, R.D., Szöllösi-Nagy, A., Tessler, Z., Uhlenbrook, S. Ecosystem-based water security and the Sustainable Development Goals (SDGs). *Ecohydrol Hydrobiol*. 2018,18,317-33.

(259) Miara, A., Tarr, C., Spellman, R., Vörösmarty, C.J., Macknick, J.E. The power of efficiency: Optimizing environmental and social benefits through demand-side-management. *Energy*. 2014,76,502-12.

(260) Van Vliet, M.T., Wiberg, D., Leduc, S., Riahi, K. Power-generation system vulnerability and adaptation to changes in climate and water resources. *Nat Clim Change*. 2016,6,375.

(261) Lohrmann, A., Farfan, J., Caldera, U., Lohrmann, C., Breyer, C. Global scenarios for significant water use reduction in thermal power plants based on cooling water demand estimation using satellite imagery. *Nat Energy*. 2019,4,1040-8.

(262) Bakken, T.H., Killingtveit, A., Engeland, K., Alfredsen, K., Harby, A. Water consumption from hydropower plants - review of published estimates and an assessment of the concept. *Hydrology and Earth System Sciences*. 2013,17,3983-4000.

(263) Grubert, E.A. Water consumption from hydroelectricity in the United States. *Adv Water Resour*. 2016,96,88-94.

(264) National Bureau of Statistics of China. Electricity Balance Sheet. 2019.

- (265) Madden, N., Lewis, A., Davis, M. Thermal effluent from the power sector: an analysis of once-through cooling system impacts on surface water temperature. *Environ Res Lett.* 2013,8,035006.
- (266) Logan, L.H., Stillwell, A.S. Probabilistic assessment of aquatic species risk from thermoelectric power plant effluent: Incorporating biology into the energy-water nexus. *Appl Energy.* 2018,210,434-50.
- (267) Raptis, C.E., Pfister, S. Global freshwater thermal emissions from steam-electric power plants with once-through cooling systems. *Energy.* 2016,97,46-57.
- (268) Yang, L.P., Wang, Y.J., Liang, H., Wang, Y.H., Cui, Y.X., Chen, Y.F. Influence of thermal drainage from power plants on environment. *Sci Technol Innov Herald.* 2018,124-7.
- (269) Xin-yu, W., Yi-chuan, W., Kun, Z., Yu-qin, D., Xiao-wei, X., Zhao-rong, S. Review of Impact Assessments of Thermal Discharges from Power Plants on Aquatic Biota. *Journal of Hydroecology.* 2018,39,1-10.
- (270) Raptis, C.E., van Vliet, M.T.H., Pfister, S. Global thermal pollution of rivers from thermoelectric power plants. *Environ Res Lett.* 2016,11,9.
- (271) Pfister, S., Suh, S. Environmental impacts of thermal emissions to freshwater: Spatially explicit fate and effect modeling for life cycle assessment and water footprinting. *Int J Life Cycle Assess.* 2015,20,927.
- (272) Cheng, Y., Jiang, Y., Qu, J., Xue, Z., Wu, K. Heat effect of warm water discharge from power plant on fish: with different discharge arrangements. *Thermal Power Generation.* 2017,46,101-6.
- (273) Wiedmann, T., Lenzen, M. Environmental and social footprints of international trade. *Nat Geosci.* 2018,11,314-21.
- (274) Xenopoulos, M.A., Lodge, D.M., Alcamo, J., Märker, M., Schulze, K., Van Vuuren, D.P. Scenarios of freshwater fish extinctions from climate change and water withdrawal. *Global Change Biol.* 2005,11,1557-64.
- (275) Grosberg, R.K., Vermeij, G.J., Wainwright, P.C. Biodiversity in water and on land. *Curr Biol.* 2012,22,R900-3.
- (276) Hanafiah, M.M., Xenopoulos, M.A., Pfister, S., Leuven, R.S.E.W., Huijbregts, M.A.J. Characterization Factors for Water Consumption and Greenhouse Gas Emissions Based on Freshwater Fish Species Extinction. *Environ Sci Technol.* 2011,45,5272-8.
- (277) Tapio, P. Towards a theory of decoupling: degrees of decoupling in the EU

- and the case of road traffic in Finland between 1970 and 2001. *Transport Policy*. 2005,12,137-51.
- (278) Ang, B., Zhang, F., Choi, K. Factorizing changes in energy and environmental indicators through decomposition. *Energy*. 1998,23,489-95.
- (279) Tang, X., Jin, Y., McLellan, B.C., Wang, J., Li, S. China's coal consumption declining—Impermanent or permanent? *Resour Conserv Recycl*. 2018,129,307-13.
- (280) Ang, B.W. LMDI decomposition approach: A guide for implementation. *Energy Policy*. 2015,86,233-8.
- (281) Ministry of Water Resources of the People's Republic of China. Lengths of major rivers in China. 2003.
- (282) Ministry of Water Resources of the People's Republic of China. Bulletin of river sediment in China. 2020.
- (283) Chinese Hydraulic Engineering Society. China Water Resources. 2016.
- (284) Ministry of Water Resources of the People's Republic of China. China Water Statistical Yearbook. 2018.
- (285) International Energy Agency. World Energy Outlook 2020. 2020.
- (286) Standardization Administration. Norm of water intake Part 1: Electric power production. 2012.
- (287) National Energy Administration. Water saving guideline for thermal power plant. 2018.
- (288) Pan, L., Liu, Z., Zhang, B. Comprehensive analysis and related measures on current situation of water saving of thermal power generation in China. *Electric Power (Chinese)*.50,158-63.
- (289) Xu, H., Lei, Y., Lu, C., Xie, Y. Comparative analysis of direct and indirect air cooling system for thermal power unit selection. *Air Pollution Control (Chinese)*. 2014,101-4.
- (290) Kuipers, K.J.J., Hellweg, S., Verones, F. Potential Consequences of Regional Species Loss for Global Species Richness: A Quantitative Approach for Estimating Global Extinction Probabilities. *Environ Sci Technol*. 2019,53,4728-38.
- (291) Byers, E.A., Hall, J.W., Amezaga, J.M. Electricity generation and cooling water use: UK pathways to 2050. *Glob Environ Change*. 2014,25,16-30.
- (292) Rosa, L., Reimer, J.A., Went, M.S., D'Odorico, P. Hydrological limits to carbon capture and storage. *Nat Sustain*. 2020,658–66.

- (293) Kati, V., Kassara, C., Vrontisi, Z., Moustakas, A. The biodiversity-wind energy-land use nexus in a global biodiversity hotspot. *Sci Total Environ.* 2021,768,144471.
- (294) Wu, X., Shao, L., Chen, G., Han, M., Chi, Y., Yang, Q., Alhodaly, M., Wakeel, M. Unveiling land footprint of solar power: A pilot solar tower project in China. *J Environ Manage.* 2021,280,111741.
- (295) Barbarossa, V., Schmitt, R.J.P., Huijbregts, M.A.J., Zarfl, C., King, H., Schipper, A.M. Impacts of current and future large dams on the geographic range connectivity of freshwater fish worldwide. *Proc Natl Acad Sci U S A.* 2020,117,3648-55.
- (296) Heino, J., Paavola, R., Virtanen, R., Muotka, T. Searching for biodiversity indicators in running waters: do bryophytes, macroinvertebrates, and fish show congruent diversity patterns? *Biodiversity & Conservation.* 2005,14,415-28.
- (297) Tendall, D.M., Hellweg, S., Pfister, S., Huijbregts, M.A.J., Gaillard, G. Impacts of River Water Consumption on Aquatic Biodiversity in Life Cycle Assessment—A Proposed Method, and a Case Study for Europe. *Environ Sci Technol.* 2014,48,3236-44.
- (298) Sun, Z., Zhang, L., Duan, Z. Number and scale of hydropower station projects in China. *China Water Resources.* 2013,12-3.
- (299) van Vliet, M.T.H., Yearsley, J.R., Franssen, W.H.P., Ludwig, F., Haddeland, I., Lettenmaier, D.P., Kabat, P. Coupled daily streamflow and water temperature modelling in large river basins. *Hydrol Earth Syst Sci.* 2012,16,4303-21.
- (300) Miara, A., Macknick, J.E., Vörösmarty, C.J., Tidwell, V.C., Newmark, R., Fekete, B. Climate and water resource change impacts and adaptation potential for US power supply. *Nature Climate Change.* 2017,7,793.
- (301) Zheng, X., Wang, C., Cai, W., Kumm, M., Varis, O. The vulnerability of thermoelectric power generation to water scarcity in China: Current status and future scenarios for power planning and climate change. *Appl Energy.* 2016,171,444-55.
- (302) Liu, L., Hejazi, M., Li, H., Forman, B., Zhang, X. Vulnerability of US thermoelectric power generation to climate change when incorporating state-level environmental regulations. *Nat Energy.* 2017,2,17109.
- (303) Zhang, C., Anadon, L.D., Mo, H., Zhao, Z., Liu, Z. Water-carbon trade-off in China's coal power industry. *Environ Sci Technol.* 2014,48.
- (304) Tang, B., Wu, Y., Yu, B., Li, R., Wang, X. Co-current analysis among

- electricity-water-carbon for the power sector in China. *Sci Total Environ.* 2020,745,141005.
- (305) Ministry of Science and Technology of the People's Republic of China. Roadmap for carbon capture, utilization and storage technology development in China (2019). 2019.
- (306) Wu, X.D., Guo, J.L., Chen, G.Q. The striking amount of carbon emissions by the construction stage of coal-fired power generation system in China. *Energy Policy.* 2018,117,358-69.
- (307) Fan, J.-L., Shen, S., Xu, M., Yang, Y., Yang, L., Zhang, X. Cost-benefit comparison of carbon capture, utilization, and storage retrofitted to different thermal power plants in China based on real options approach. *Adv Clim Change Res.* 2020.
- (308) Liu, L., Hejazi, M., Iyer, G., Forman, B.A. Implications of water constraints on electricity capacity expansion in the United States. *Nat Sustain.* 2019,2,206-13.
- (309) Bartos, M.D., Chester, M.V. Impacts of climate change on electric power supply in the Western United States. *Nature Climate Change.* 2015,5,748.
- (310) Fan, J.-L., Wei, S., Yang, L., Wang, H., Zhong, P., Zhang, X. Comparison of the LCOE between coal-fired power plants with CCS and main low-carbon generation technologies: Evidence from China. *Energy.* 2019,176,143-55.
- (311) Zhu, Y., Chen, M., Yang, Q., Alshwaikh, M.J.M., Zhou, H., Li, J., Liu, Z., Zhao, H., Zheng, C., Bartocci, P., Fantozzi, F. Life cycle water consumption for oxyfuel combustion power generation with carbon capture and storage. *J Clean Prod.* 2021,281.
- (312) Zhao, X., Liao, X., Zhang, C., Zhang, X., Mao, G., Zhang, S., Tillotson, M.R. Unveiling the dynamic of water-electricity conflict within and beyond megacity boundary. *J Environ Manage.* 2021,286,112259.
- (313) Sutanudjaja, E.H., van Beek, R., Wanders, N., Wada, Y., Bosmans, J.H.C., Drost, N., van der Ent, R.J., de Graaf, I.E.M., Hoch, J.M., de Jong, K., Karssenbergh, D., López López, P., Peßenteiner, S., Schmitz, O., Straatsma, M.W., Vannamettee, E., Wisser, D., Bierkens, M.F.P. PCR-GLOBWB 2: a 5 arcmin global hydrological and water resources model. *Geosci Model Dev.* 2018,11,2429-53.
- (314) Ward, P.J., Winsemius, H.C., Kuzma, S., Bierkens, M.F.P. *Aqueduct Floods Methodology.* World Resources Institute. 2020.
- (315) Han, Q., Tan, G., Fu, X., Yang, H., Li, X. Calculation methods of river environmental flow and their applications. *Engineering Journal of Wuhan*

University. 2018,51,189-97.

(316) MartinaFlörke. Domestic and industrial water uses of the past 60 years as a mirror of socio-economic development: A global simulation study. *Global Environmental Change*. 2013,23,144-56.

(317) Zeke H, P., G.P. Emissions – the ‘business as usual’ story is misleading. *Nature*. 2020,618-20.

(318) Rosa, L., Chiarelli, D.D., Rulli, M.C., Dell’Angelo, J., D’Odorico, P. Global agricultural economic water scarcity. *Sci Adv*. 2020,6,eaaz6031.

(319) Koch, H., Vögele, S. Dynamic modelling of water demand, water availability and adaptation strategies for power plants to global change. *Ecol Econ*. 2009,68,2031-9.

(320) Wang, Y. Vulnerability of existing and planned coal-fired power plants in developing Asia to changes in climate and water resources. *Energy Environ Sci*. 2019,12.

(321) Morris, J., Paltsev, S., Ku, A.Y. Impacts of China's emissions trading schemes on deployment of power generation with carbon capture and storage. *Energy Econ*. 2019,81,848-58.

(322) Hu, B., Zhai, H. The cost of carbon capture and storage for coal-fired power plants in China. *Int J Greenhouse Gas Control*. 2017,65,23-31.

(323) Meldrum, J., Nettles-Anderson, S., Heath, G., Macknick, J. Life cycle water use for electricity generation: a review and harmonization of literature estimates. *Environ Res Lett*. 2013,8,015031.

(324) Larsen, M.A.D., Petrovic, S., Engström, R.E., Drews, M., Liersch, S., Karlsson, K.B., Howells, M. Challenges of data availability: Analysing the water-energy nexus in electricity generation. *Energy Strategy Reviews*. 2019,26.

(325) National Energy Administration. Notice of the National Energy Administration on the Issue of the Risk Early Warning for 2023 Coal Power Planning and Construction 2020.

(326) Institute of Geographic Sciences and Natural Resources Research. Thirsty coal: Coal power base development and water resources research. 2012.

(327) Yang, J., Huang, X., Tang, Q. Satellite-derived river width and its spatiotemporal patterns in China during 1990–2015. *Remote Sensing of Environment*. 2020,247.

(328) Cui, R.Y., Hultman, N., Cui, D., McJeon, H., Yu, S., Edwards, M.R., Sen, A.,

- Song, K., Bowman, C., Clarke, L., Kang, J., Lou, J., Yang, F., Yuan, J., Zhang, W., Zhu, M. A plant-by-plant strategy for high-ambition coal power phaseout in China. *Nat Commun.* 2021,12,1468.
- (329) Huang, P.F., Wang, X.J., Zhang, Y., Wang, S.H., Wang, X.L., LI, D.Y. The State of the Art of Desalination Development and Research on Exploration Scheme in China. *Journal of Salt Science and Chemical Industry.* 2020,49,6-10.
- (330) Zhang, Y., Li, J., Tian, Y., Deng, Y., Xie, K. Virtual water flow associated with interprovincial coal transfer in China: Impacts and suggestions for mitigation. *J Clean Prod.* 2021.
- (331) The State Council of the People's Republic of China. The CPC Central Committee's proposals for formulating the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and the Long-Range Objectives Through the Year 2035. 2020.
- (332) Wen, W., Feng, C., Zhou, H., Zhang, L., Wu, X., Qi, J., Yang, X., Liang, Y. Critical provincial transmission sectors for carbon dioxide emissions in China. *Renew Sustain Energy Rev.* 2021,149.
- (333) Zhao, X., Ma, X., Chen, B., Shang, Y., Song, M. Challenges toward carbon neutrality in China: Strategies and countermeasures. *Resour Conserv Recycl.* 2022,176.
- (334) Fan, J.-L., Wei, S., Zhang, X., Yang, L. A comparison of the regional investment benefits of CCS retrofitting of coal-fired power plants and renewable power generation projects in China. *Int J Greenhouse Gas Control.* 2020,92.
- (335) Schwalm, C.R., Glendon, S., Duffy, P.B. RCP8.5 tracks cumulative CO₂ emissions. *Proc Natl Acad Sci U S A.* 2020,117,19656-7.
- (336) National Energy Administration. Supervision reports on the investment results of ten typical power grid projects, such as Zhejiang-Fujian ultra-high voltage. 2018.
- (337) Xu, W., Xie, Y., Cai, Y., Ji, L., Wang, B., Yang, Z. Environmentally-extended input-output and ecological network analysis for Energy-Water-CO₂ metabolic system in China. *Sci Total Environ.* 2021,758,143931.
- (338) Meng, F., Wang, D., Meng, X., Li, H., Liu, G., Yuan, Q., Hu, Y., Zhang, Y. Mapping urban energy–water–land nexus within a multiscale economy: A case study of four megacities in China. *Energy.* 2022,239.
- (339) Feng, C., Qu, S., Jin, Y., Tang, X., Liang, S., Chiu, A.S.F., Xu, M. Uncovering urban food-energy-water nexus based on physical input-output

- analysis: The case of the Detroit Metropolitan Area. *Appl Energy*. 2019,252.
- (340) Notice of restricted fishing range and duration in key waters of the Yangtze River Basin. 2020.
- (341) Ramjeawon, T. Life cycle assessment of electricity generation from bagasse in Mauritius. *J Clean Prod*. 2008,16,1727-34.
- (342) Wang, C.Y., Li, P.G., Liu, Y. Investigation of water-energy-emission nexus of air pollution control of the coal-fired power industry: A case study of Beijing-Tianjin-Hebei region, China. *Energy Policy*. 2018,115,291-301.
- (343) Yuan, J.H., Lei, Q., Xiong, M.P., Guo, J.S., Zhao, C.H. Scenario-Based Analysis on Water Resources Implication of Coal Power in Western China. *Sustainability*. 2014,6,7155-80.
- (344) Burkhardt, J.J., Heath, G.A., Turchi, C.S. Life Cycle Assessment of a Parabolic Trough Concentrating Solar Power Plant and the Impacts of Key Design Alternatives. *Environ Sci Technol*. 2011,45,2457-64.
- (345) Frisvold, G.B., Marquez, T. Water Requirements for Large-Scale Solar Energy Projects in the West. *J Contemp Water Res Educ*. 2013,151,106-16.
- (346) Klein, S.J.W. Multi-Criteria Decision Analysis of Concentrated Solar Power with Thermal Energy Storage and Dry Cooling. *Environ Sci Technol*. 2013,47,13925-33.
- (347) Klein, S.J.W., Rubin, E.S. Life cycle assessment of greenhouse gas emissions, water and land use for concentrated solar power plants with different energy backup systems. *Energy Policy*. 2013,63,935-50.
- (348) Schroeder, J.N., Harto, C.B., Clark, C.E. Federal policy documentation and geothermal water consumption: Policy gaps and needs. *Energy Policy*. 2015,84,58-68.
- (349) Schroeder, J.N., Harto, C.B., Horner, R.M., Clark, C.E. Geothermal Water Use: Life Cycle Water Consumption, Water Resource Assessment, and Water Policy Framework. United States: U. S. Department of Energy; 2014.
- (350) Clark, C.E., Harto, C.B., Schroeder, J.N., Martino, L.E., Horner, R.M. Life Cycle Water Consumption and Water Resource Assessment for Utility-Scale Geothermal Systems: An In-Depth Analysis of Historical and Forthcoming EGS Projects. United States: U. S. Department of Energy; 2013a.
- (351) Clark, C.E., Harto, C.B., Sullivan, J.L., Wang, M.Q. Water use in the development and operation of geothermal power plants. United States: U. S.

Department of Energy; 2011.

(352) Kotb, S.A., Abdelaal, M.M.Z. Analysis of the impact of introduction of nuclear power plants on energy characteristics and environment in Egypt. *Electr Eng.* 2018,100,285-92.

(353) Chen, Q.W., Qi, B.Q., Jiang, Q., Jin, D. Nuclear power development and water resources management. *J Hohai Univ.* 2010,4.

(354) Mielke, E. *Water Consumption of Energy Resource Extraction, Processing, and Conversion.* 2010.

(355) Peng, B. Analyzing the water use of biomass power generation project.(in Chinese). *ZHI HUI* 2014,42-4.

(356) Clark, C.E., Horner, R.M., Harto, C.B. Life Cycle Water Consumption for Shale Gas and Conventional Natural Gas. *Environ Sci Technol.* 2013b,47,11829-36.

(357) Liao, X., Hall, J.W. Drivers of water use in China's electric power sector from 2000 to 2015. *Environ Res Lett.* 2018,13.

(358) Zhang, C., Zhong, L.J., Fu, X.T., Zhao, Z.N. Managing Scarce Water Resources in China's Coal Power Industry. *Environ Manag.* 2016b,57,1188-203.

(359) Bakken, T.H., Modahl, I.S., Raadal, H.L., Bustos, A.A., Arnoy, S. Allocation of water consumption in multipurpose reservoirs. *Water Policy.* 2016b,18,932-47.

(360) Yang, Q., Liang, J., Li, J., Yang, H., Chen, H. Life cycle water use of a biomass-based pyrolysis polygeneration system in China. *Appl Energy.* 2018,224,469-80.

(361) Lin, B., He, J. Is biomass power a good choice for governments in China? *Renew Sustain Energy Rev.* 2017,73,1218-30.

(362) Wu, Y., Sun, X., Lu, Z., Zhou, J., Xu, C. Optimal site selection of straw biomass power plant under 2-dimension uncertain linguistic environment. *J Clean Prod.* 2019,212,1179-92.

(363) McDonald, R.I., Olden, J.D., Opperman, J.J., Miller, W.M., Fargione, J., Revenga, C., Higgins, J.V., Powell, J. Energy, Water and Fish: Biodiversity Impacts of Energy-Sector Water Demand in the United States Depend on Efficiency and Policy Measures. *PLoS One.* 2012,7.

(364) Harte, J., El-Gasseir, M. *Energy and Water.* Science. 1978,199,623.

(365) Kania, J.J. Economics of coal transport by slurry pipeline versus unit train: A

References

- case study. *Energy Economics*. 1984,6,131-8.
- (366) Zhang, C., Anadon, L.D., Mo, H., Zhao, Z., Liu, Z. Water–Carbon Trade-off in China’s Coal Power Industry. *Environ Sci Technol*. 2014,48,11082-9.
- (367) Committee of Yearbook of China water resources. *Yearbook of China water resources*. 2014.
- (368) Tibet academy of agricultural and animal husbandry sciences. *Water resources of Tibet*. 2020.
- (369) Yan, S., Zeng, D., Liu, J., Wang, W., Xie, X. A Soft-sensor Method of Reheat Steam Flow Based on Simplified Heat-balance Equation. *Chin Soc for Elec Eng*. 2011,31,114-9.
- (370) Cheng, F., Fan, S., Zhao, J. Improve Thermal Efficiency by Stabilizing Steam Parameters of Power Plant Boiler. *Energy and Energy Conversion*. 2013,71-4.
- (371) Wanders, N., van Vliet, M.T.H., Wada, Y., Bierkens, M.F.P., van Beek, L.P.H.R. Global monthly water temperature dataset, derived from dynamical 1-D water-energy routing model (DynWat) at 10 km spatial resolution (1.1). 2018.
- (372) Wei, X., Xia Binqiang, Yuzhu, W. Measuring Method of Hydroelectric Generator Efficiency Based on Infrared Thermal Imaging Technology. *China Water Power & Electrification*. 2018,6,12-8.
- (373) Yan, Y., Hao, J. Consumption measurement and efficiency calculation for large-sized hydraulic generators based on calorimetric method. *Hunnan Electric Power*. 2014,34,8-11.
- (374) Pfister, S., Suh, S. Environmental impacts of thermal emissions to freshwater: spatially explicit fate and effect modeling for life cycle assessment and water footprinting. *The International Journal of Life Cycle Assessment*. 2015,20,927-36.
- (375) Pfister, S., Koehler, A., Hellweg, S. Assessing the Environmental Impacts of Freshwater Consumption in LCA. *Environ Sci Technol*. 2009,43,4098.
- (376) Resource and Environment Science and Data Center. *China’s land use type*. 2020.