Paths to a **Green Economy**:

Entrepreneurial Spirit Shaping the Transition

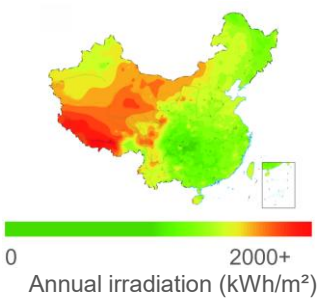
ZHU Junming

Tsinghua University

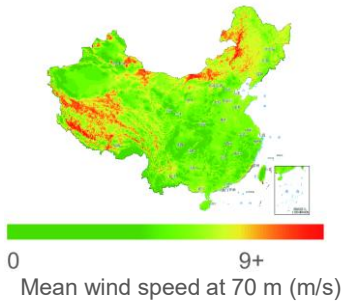
energy transition: connecting renewables with demand

inter-provincial transmission ≈ **20.5%** national use

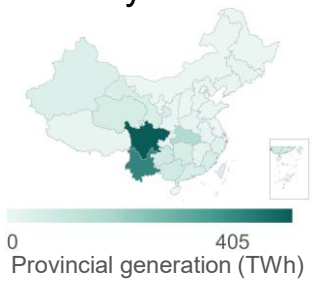
solar



wind



hydro





Selected cross-regional UHV corridors

Highlighted: ±800 kV DC · 8 GW per project

Qinghai–Henan · 2020
Wind–solar–hydro

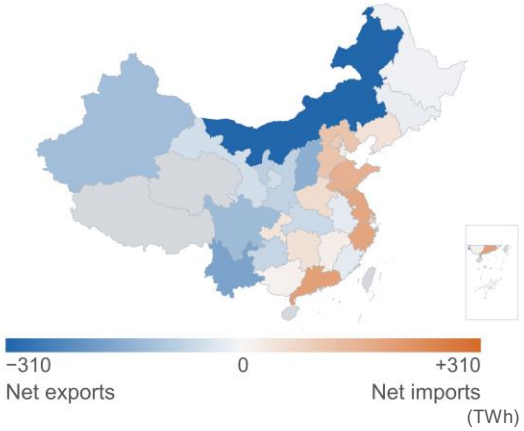
Kunliulong · 2020
Three-terminal hydropower transmission

Dashed: county-level corridor approximation

Baihetan–Zhejiang · 2022/23
Hydropower to the Yangtze River Delta

Hami–Chongqing · 2025
Wind–solar plus balancing coal power

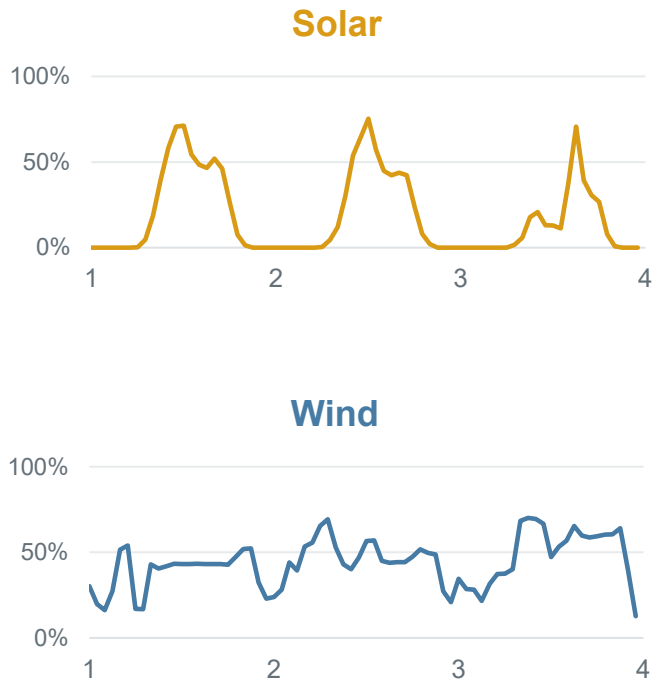
net electricity flow



Maps: CMA (2024 wind/solar); Yi et al. / Figshare (demand); NBS 2025, Table 9-19 (hydro); CEC via Dianchacha (net flows).
Routes: Fu et al. GIS (2025 snapshot, ArcGIS mirror) + published project corridors. Selected, geographically generalized routes; not an as-built survey.
Base: DataV / AMap. System statistic: CEC (2026).

energy transition: storing renewables for need

variable output



two example plants, 1-3 June 2019

Measured output; hourly means as % of rated capacity

different paths to storage

established at scale



pumped hydro

Large-scale storage



lithium-ion

Modular deployment

exploring new routes



compressed air

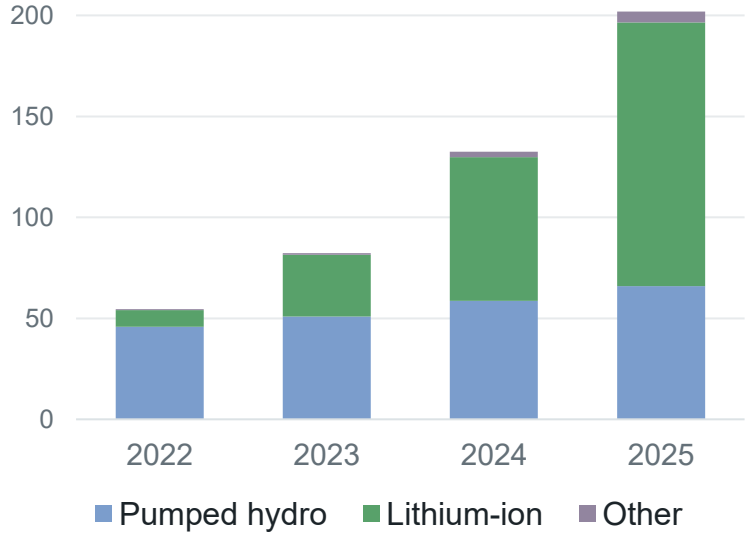
Recover compression heat



solid gravity

Lift and lower blocks

growing storage deployment



30 TWh in 2025

2 percentage points higher renewable use

2.4 hours of evening-peak support in pilot

Sources: Chen & Xu, Scientific Data (2022); NEA (2026); CAS; China Tianying / Energy Vault.

energy transition: wider electrification

clean electricity



transmission
+ storage

transport & machinery



V2G · Shenzhen



electric loaders

parked vehicles supply power back to the grid

Local discharge trial · June 2025

58% of domestic loader sales were electric

13.4% lower peak grid load in one transformer area

buildings



heat pumps + thermal storage

Dongsheng Science Park just outside Tsinghua ~700,000 m²

industry



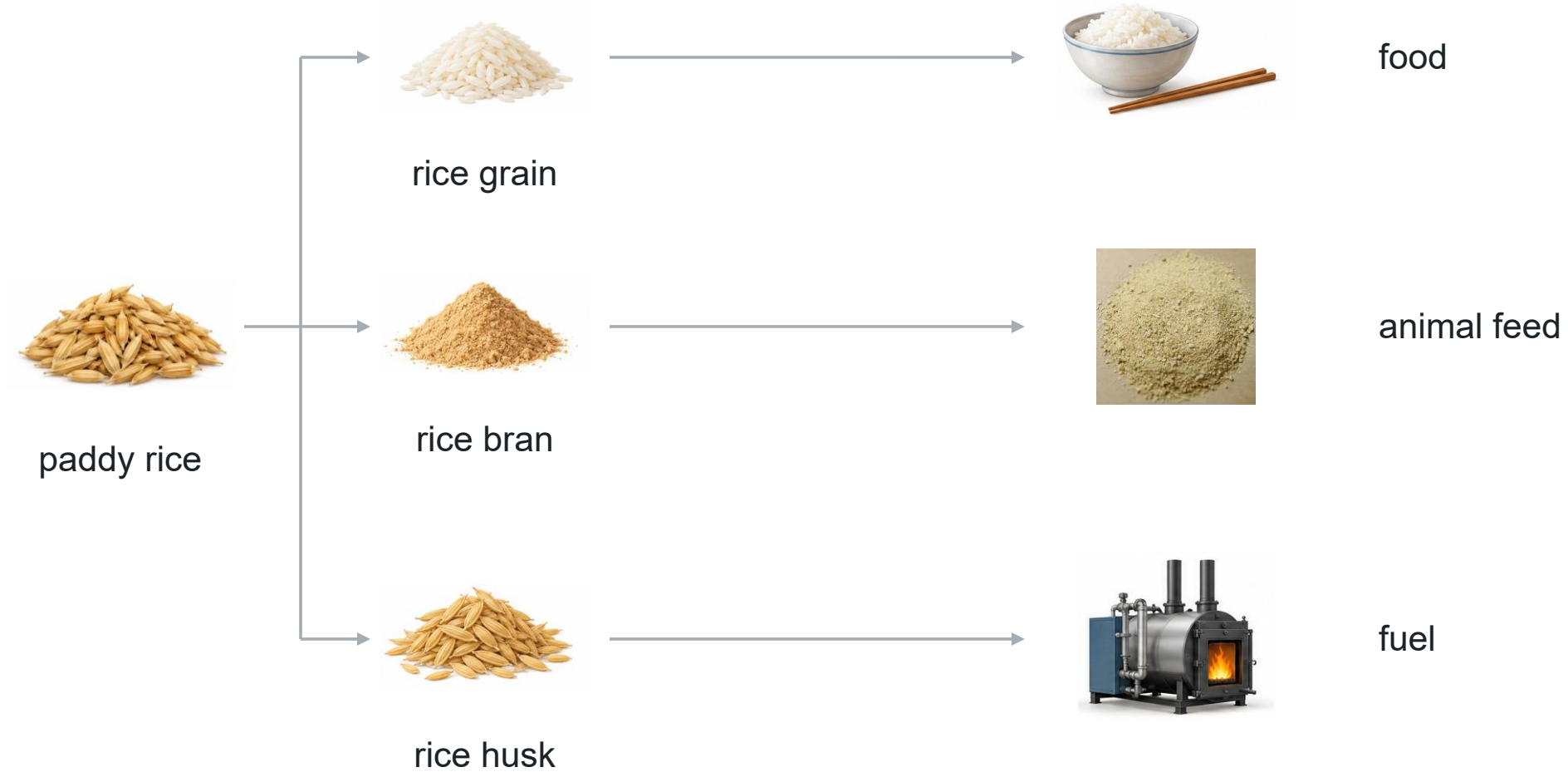
electric arc furnaces

Danieli's equipment used in Shanghai's steelmaking

Sources: XCMG; Shenzhen/Longhua DRC; Beijing/Haidian authorities; Dongfang Electric and Sinopharm.

industrial transition: circular economy in food processing

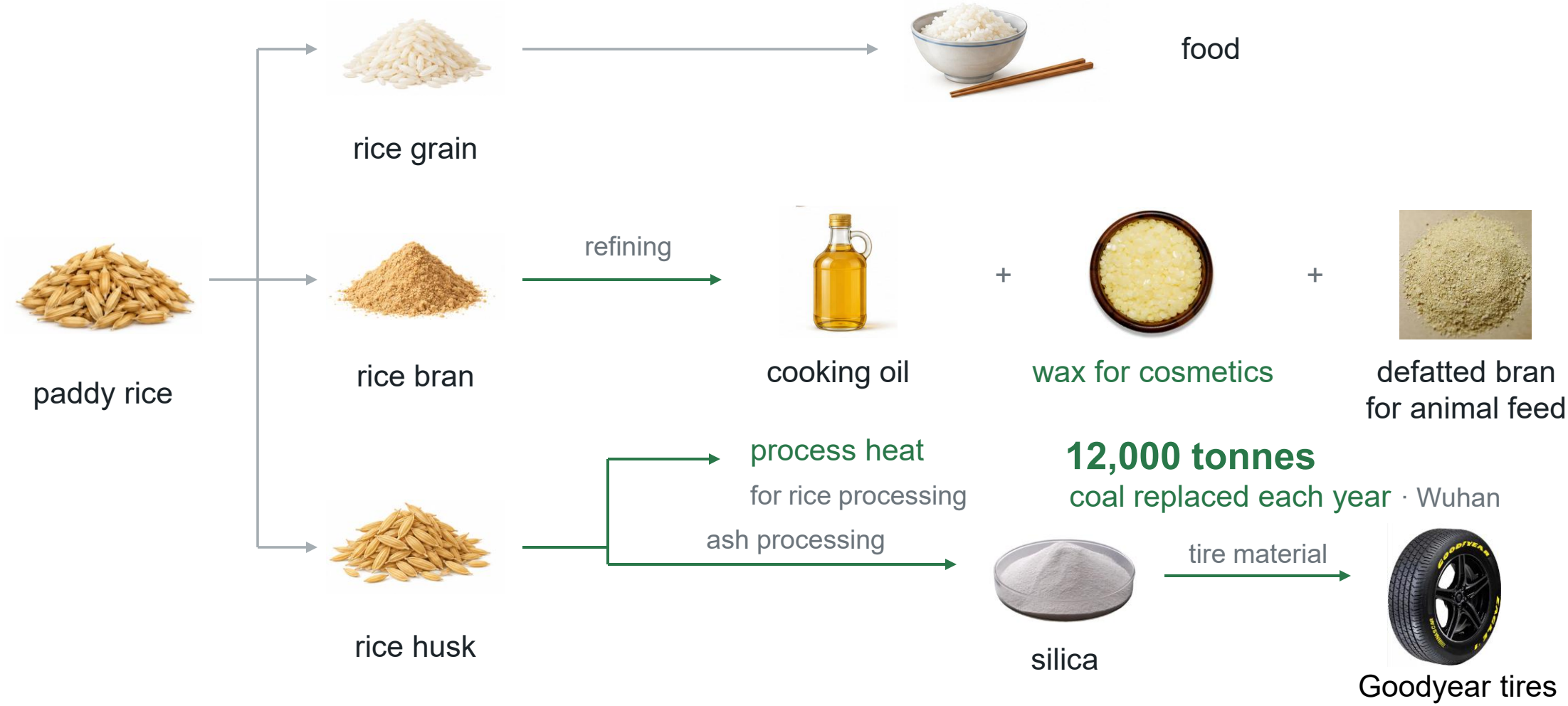
food processing and circularity: the conventional way



source: Yihai Kerry (2016), rice processing and by-product use.

industrial transition: circular economy in food processing

food processing and circularity: the Yihai Kerry case



examples across Yihai Kerry plants and its supply chain. sources: Yihai Kerry; Taizhou CMC (2025); Dongxihu (2025); Goodyear (2015).

industrial transition: AI and robotics for resource efficiency

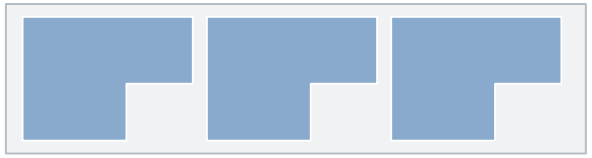
steel processing: the SANY case

manual marking



human experience + AI planning

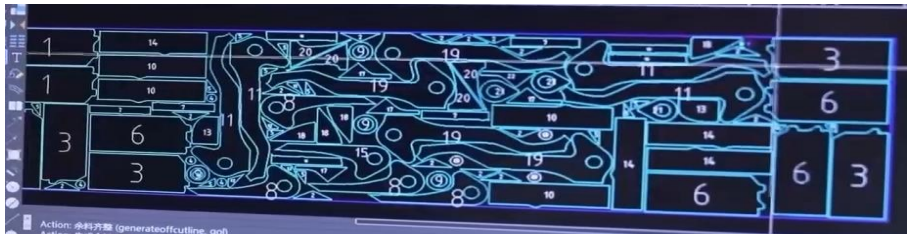
one product line



parts across product lines



AI nesting across product lines



robotic production



lights-out machining



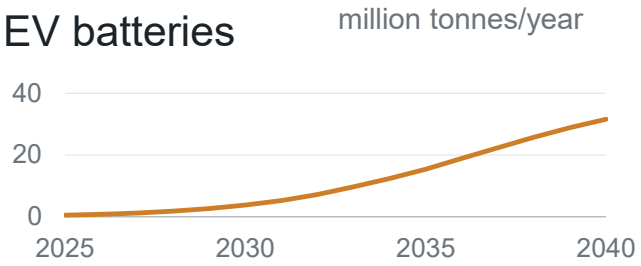
+11 PP in steel utilization

sources: CCTV; SANY.

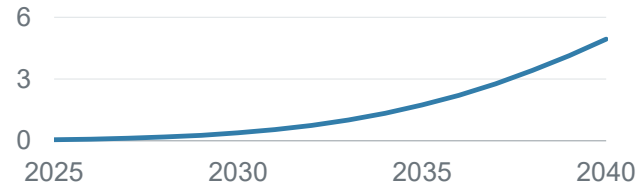
industrial transition: preparing for clean energy recycling

projected retirement wave

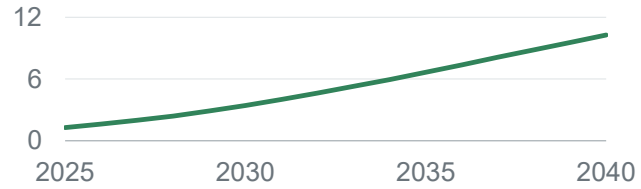
EV batteries



solar PV equipment



wind equipment



recycling capabilities



Brunp

collection networks

240+ collection points
128,700 tonnes of used batteries



CECEP

mobile on-site recycling

processing panels at solar farms
reducing transport needs



Jiapeng + SJTU

pilot recycling of blade composites

company-university collaboration
separating glass fibers from resin

projections: Zhang et al. (2025); Feng et al. (2026, digitized).
Cases/photos: Brunp; CECEP (2025–26); Xilin Gol (2024).

ecological restoration: learning through practice

regional vegetation recovery

Mu Us Sandy Land, 1985-2016



national forest cover from 13% to 25%
in the past forty years

Yuzhen Yin

40 years of persistence



an early setback:
600 seedlings planted

fewer than 10 survived

adaptation and wider uptake

explore workable path



stabilize sand with checkerboard barriers



plant hardy shrubs



establish trees later

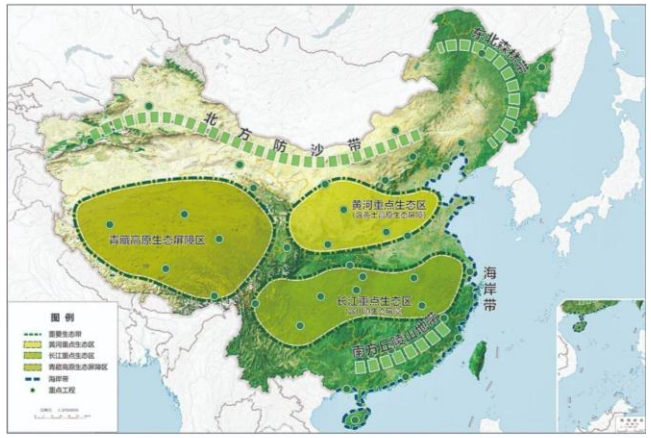
helped restore nearly 5,000 hectares with government & community support

240+ local households each planting more than 200 hectares of trees

sources: Xinhua Satellite News Lab (2020); People's Daily (2026); FAO (2026); NFGA. Method photos: Xinhua; Zhao Jida; China Today.

ecological restoration: public support across scales

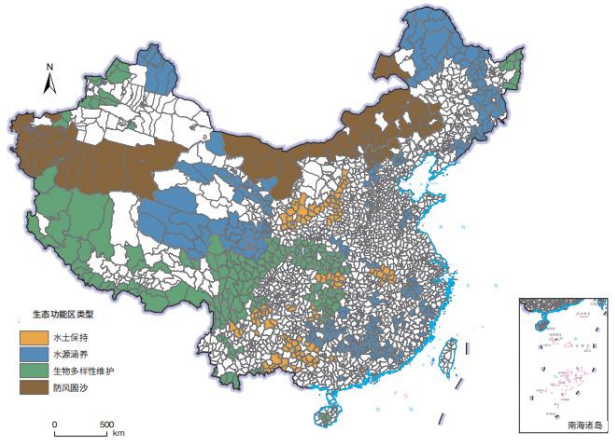
spatial framework



three zones and four belts

set broader priorities

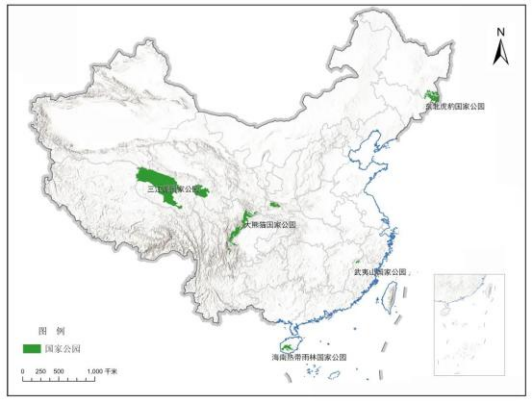
key regional functions



ecological function zones

- water conservation
- soil conservation
- biodiversity
- sand control

ecosystem protection



first five parks

established in 2021

secure long-term ecosystem protection

integrated restoration



52 Shan-Shui projects

supported by 2023

restore connected ecosystems

sources: NDRC (2020, 2025); Fan & Gao (2025); Shanshui Nature Watch (2022); MOF (2023); Shen et al. (2026)

ecological restoration: river recovery and new livelihoods

strict ten-year commercial fishing ban in key Yangtze waters since 2021

early signs of recovery



wild Yangtze finless porpoise, Yichang

+209% fish biomass (CPUE)

+13% fish species richness

livelihoods support for 231,000 former fishers



Shen family business: fish farming, processing and sales

government support: boat compensation and pensions

training, job matching and start-up loans

≈141,000 employed

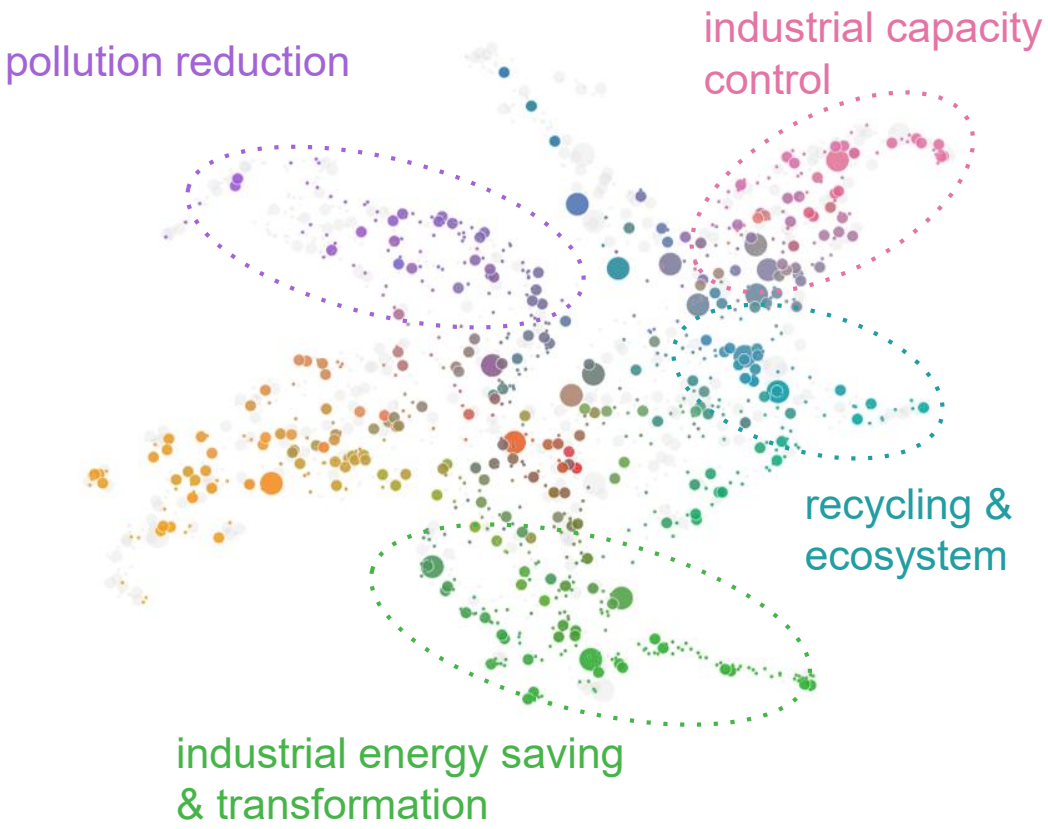
sources: Xiong et al., Science (2026), doi:10.1126/science.adu5160; State Council General Office (2024). Photos: Xinhua / Xiao Yijiu (2025); Xinhua (2022).

policy transition: evolving priorities

policy emphases change across five-year periods

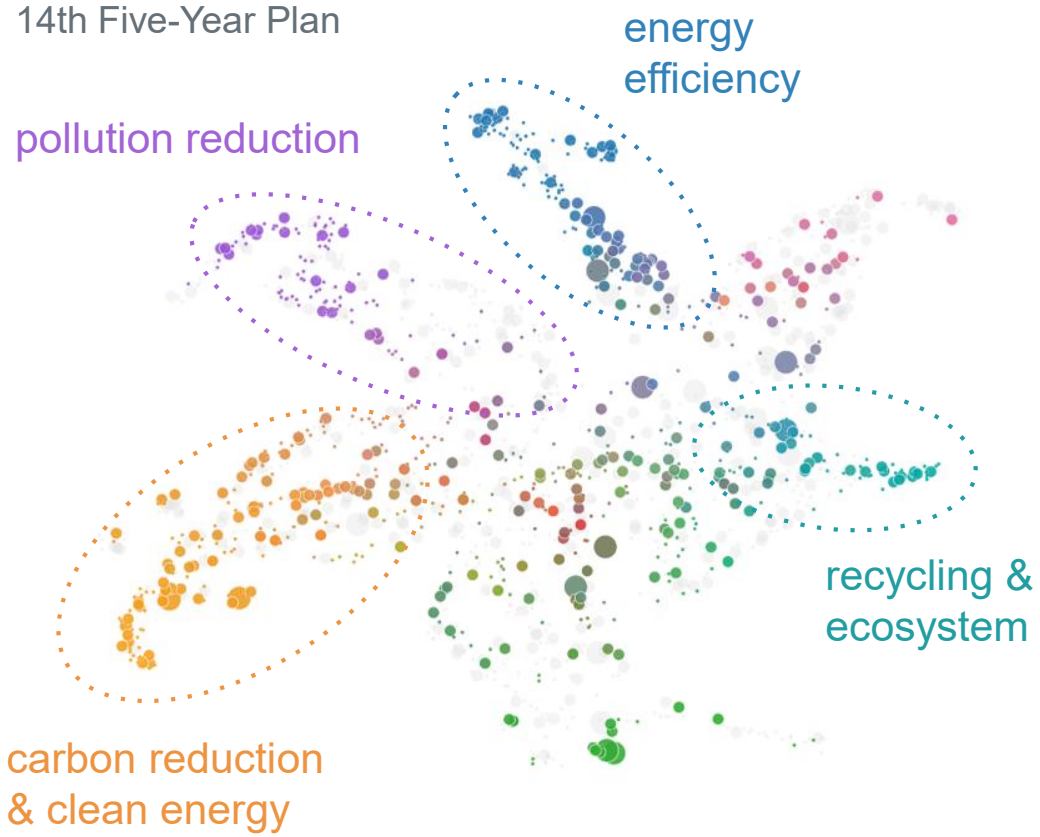
2011-2015

12th Five-Year Plan



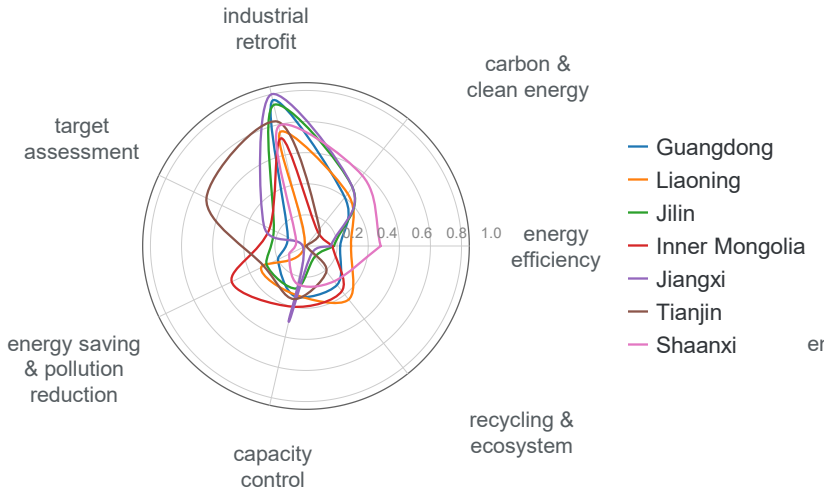
2021-2025

14th Five-Year Plan

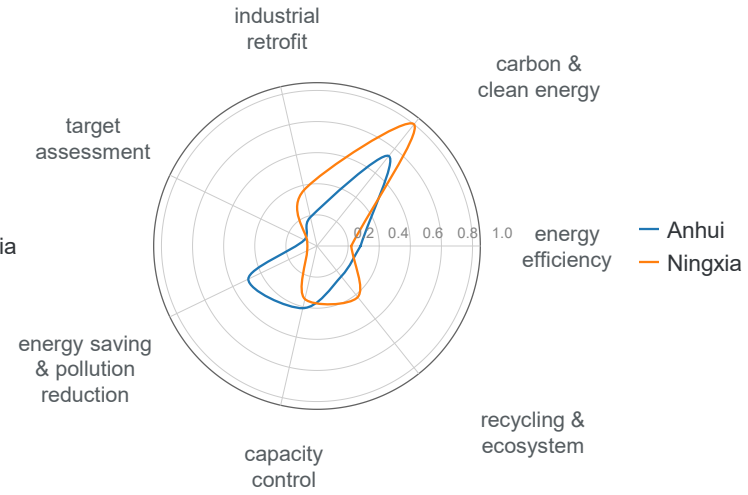


policy transition: different local policy mixes

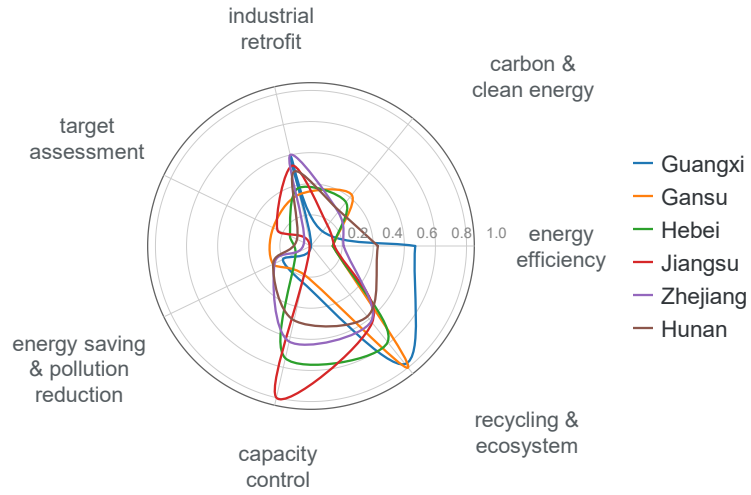
industrial retrofit



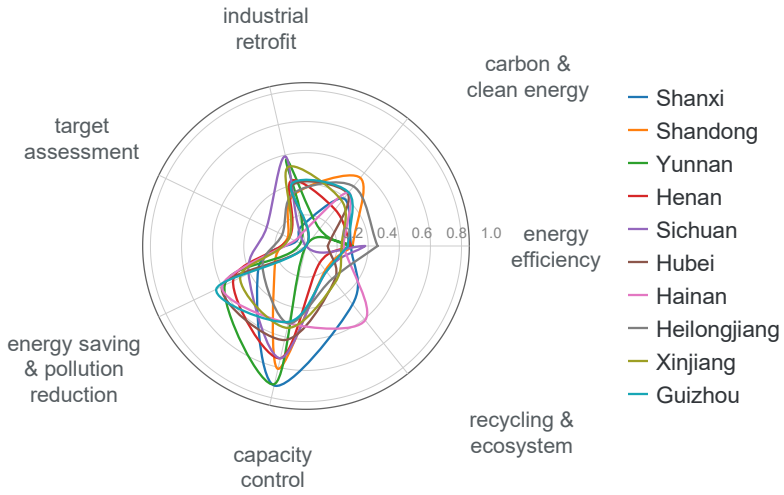
carbon & clean energy



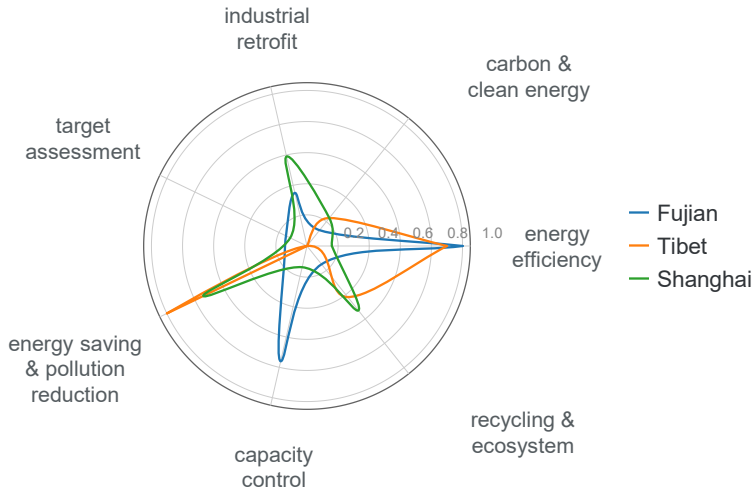
recycling & ecosystem



capacity & mixed priorities

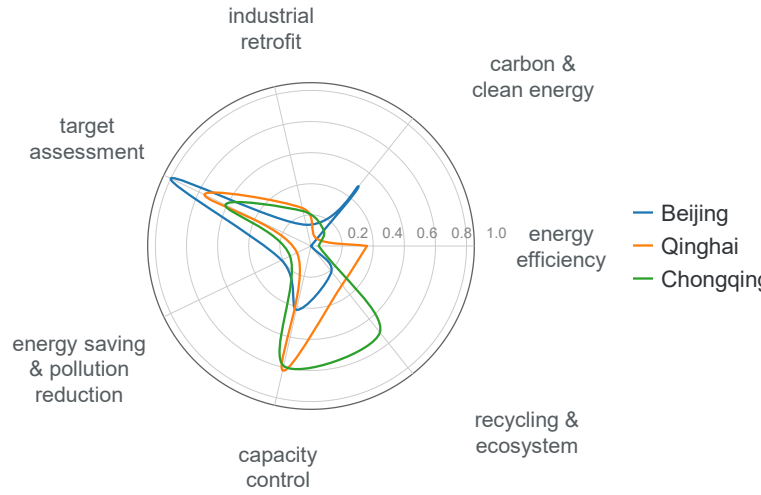


efficiency & pollution control



3 provinces

target assessment



policy transition: local exploration and national learning

common goals, locally adapted paths

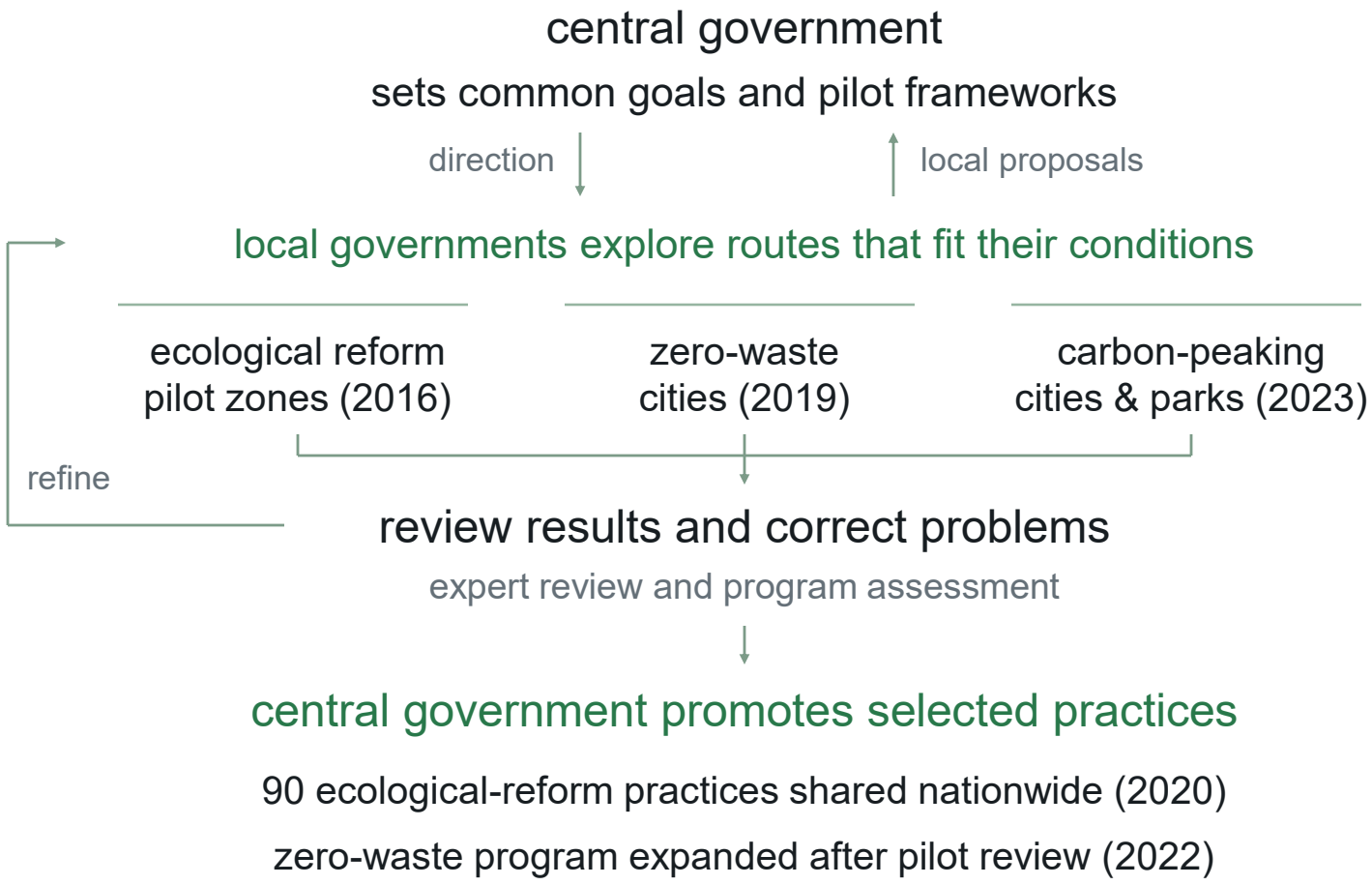
2026 carbon assessment

5 control indicators

carbon emission total & intensity
carbon intensity reduction
coal consumption total
oil consumption total
non-fossil energy share

9 supporting indicators

energy use / regional GDP
added clean electricity / added use
industrial energy & carbon intensity
project carbon replacement & reviews
green construction
green transport
public-sector carbon intensity
ETS-sector emissions targets
forest-stock growth



Sources: 2026 assessment measures; NDRC, ecological reform pilots (2020) and carbon-peaking pilots (2023); MEE, zero-waste programme (2021–2022).

paths forward: lessons and challenges

area	approaches in practice	challenges ahead
energy	connecting systems across boundaries	affordable flexibility when renewable output stays low
industry	finding value in new combinations	viable recycling systems and markets
nature	learning through practice and persistence	lasting recovery and secure livelihoods
policy	local experimentation and national learning	quick, reliable evidence and adaptive governance

Tutte le strade portano a Roma.
Grazie!