

Additional Supplementary Table for Pursuing carbon neutrality in China should enhance the resilience of its nitrogen-phosphorus coupled cycling network and also benefit food security

Supplementary Table 1. The list of nodes in the China's nitrogen and phosphorus coupled cycling network

ID	Node names	Types	Categories	Attributes
N1	Atmosphere	sector	Atmosphere	N-P coupled node
N2	Grassland	sector	Grassland	N-P coupled node
N3	Woodland	sector	Woodland	N-P coupled node
N4	Other non-arable land	sector	Other non-arable land	N-P coupled node
N5	Arable land	sector	Arable land	N-P coupled node
N6	Inland waters	sector	Inland waters	N-P coupled node
N7	Marine waters	sector	Marine waters	N-P coupled node
N8	Cultivation	sector	Cultivation	N-P coupled node
N9	Raw crops	sector	Cultivation	N-P coupled node
N10	Rice	product	Cultivation	N-P coupled node
N11	Wheat	product	Cultivation	N-P coupled node
N12	Maize	product	Cultivation	N-P coupled node
N13	Millet	product	Cultivation	N-P coupled node
N14	Sorghum	product	Cultivation	N-P coupled node
N15	Barley	product	Cultivation	N-P coupled node
N16	Other grains	product	Cultivation	N-P coupled node
N17	Beans	product	Cultivation	N-P coupled node
N18	Tubers	product	Cultivation	N-P coupled node
N19	Peanut	product	Cultivation	N-P coupled node
N20	Sesame	product	Cultivation	N-P coupled node
N21	Sunflower	product	Cultivation	N-P coupled node
N22	Other oil crops	product	Cultivation	N-P coupled node
N23	Vegetable	product	Cultivation	N-P coupled node
N24	melon and fruit	product	Cultivation	N-P coupled node
N25	Sugarcane	product	Cultivation	N-P coupled node
N26	Sugar beet	product	Cultivation	N-P coupled node
N27	Cotton	product	Cultivation	N-P coupled node
N28	Bast fibers	product	Cultivation	N-P coupled node
N29	Tobacco	product	Cultivation	N-P coupled node
N30	Seeds	sector	Cultivation	N-P coupled node
N31	Crop straws	sector	Cultivation	N-P coupled node
N32	Rice crop straw	product	Cultivation	N-P coupled node

N33	Wheat crop straw	product	Cultivation	N-P coupled node
N34	Maize crop straw	product	Cultivation	N-P coupled node
N35	Millet crop straw	product	Cultivation	N-P coupled node
N36	Sorghum crop straw	product	Cultivation	N-P coupled node
N37	Barley crop straw	product	Cultivation	N-P coupled node
N38	Other grains crop straw	product	Cultivation	N-P coupled node
N39	Beans crop straw	product	Cultivation	N-P coupled node
N40	Tubers crop straw	product	Cultivation	N-P coupled node
N41	Peanut crop straw	product	Cultivation	N-P coupled node
N42	Sesame crop straw	product	Cultivation	N-P coupled node
N43	Sunflower crop straw	product	Cultivation	N-P coupled node
N44	Other oil crops straws	product	Cultivation	N-P coupled node
N45	Vegetable crop straw	product	Cultivation	N-P coupled node
N46	Melon and fruit crop straw	product	Cultivation	N-P coupled node
N47	Sugarcane crop straw	product	Cultivation	N-P coupled node
N48	Sugar beet crop straw	product	Cultivation	N-P coupled node
N49	Cotton crop straw	product	Cultivation	N-P coupled node
N50	Bast fibers crop straw	product	Cultivation	N-P coupled node
N51	Tobacco crop straw	product	Cultivation	N-P coupled node
N52	Pasture	sector	Pasture	N-P coupled node
N53	Grazing cattle	sector	Pasture	N-P coupled node
N54	Live grazing cattle	product	Pasture	N-P coupled node
N55	Excreta from grazing cattle	product	Pasture	N-P coupled node
N56	Grazing sheep	sector	Pasture	N-P coupled node
N57	Live grazing sheep	product	Pasture	N-P coupled node
N58	Excreta from grazing sheep	product	Pasture	N-P coupled node
N59	Animal husbandry	sector	Animal husbandry	N-P coupled node
N60	Pig	sector	Animal husbandry	N-P coupled node
N61	Live pig	product	Animal husbandry	N-P coupled node
N62	Excreta from pig	product	Animal husbandry	N-P coupled node
N63	Sheep	sector	Animal husbandry	N-P coupled node
N64	Live sheep	product	Animal husbandry	N-P coupled node
N65	Excreta from sheep	product	Animal husbandry	N-P coupled node
N66	Cattle	sector	Animal husbandry	N-P coupled node
N67	Live cattle	product	Animal husbandry	N-P coupled node
N68	Excreta from cattle	product	Animal husbandry	N-P coupled node

N69	Milk	product	Animal husbandry	N-P coupled node
N70	Poultry	sector	Animal husbandry	N-P coupled node
N71	Live poultry	product	Animal husbandry	N-P coupled node
N72	Excreta from poultry	product	Animal husbandry	N-P coupled node
N73	Egg	product	Animal husbandry	N-P coupled node
N74	Horse	sector	Animal husbandry	N-P coupled node
N75	Live horse	product	Animal husbandry	N-P coupled node
N76	Excreta from horse	product	Animal husbandry	N-P coupled node
N77	Donkey	sector	Animal husbandry	N-P coupled node
N78	Live donkey	product	Animal husbandry	N-P coupled node
N79	Excreta from donkey	product	Animal husbandry	N-P coupled node
N80	Freshwater aquaculture	sector	Aquaculture	N-P coupled node
N81	Fish aquaculture in fresh water	product	Aquaculture	N-P coupled node
N82	Shrimp/crabs aquaculture in fresh water	product	Aquaculture	N-P coupled node
N83	Shellfish aquaculture in fresh water	product	Aquaculture	N-P coupled node
N84	Other aquaculture in fresh water	product	Aquaculture	N-P coupled node
N85	Excessive feed input in fresh water	product	Aquaculture	N-P coupled node
N86	Seawater aquaculture	sector	Aquaculture	N-P coupled node
N87	Fish aquaculture in sea water	product	Aquaculture	N-P coupled node
N88	Shrimp/crabs aquaculture in sea water	product	Aquaculture	N-P coupled node
N89	Shellfish aquaculture in sea water	product	Aquaculture	N-P coupled node
N90	Algae aquaculture in sea water	product	Aquaculture	N-P coupled node
N91	Other aquaculture in sea water	product	Aquaculture	N-P coupled node
N92	Excessive feed input in sea water	product	Aquaculture	N-P coupled node
N93	Chemical pesticide	product	Pesticide and detergent production	N-P coupled node
N94	Waste water from chemical pesticide production	product	Pesticide and detergent production	N-P coupled node
N95	Soap and detergent	product	Pesticide and detergent production	N-P coupled node
N96	Waste water from synthetic detergent production	product	Pesticide and detergent production	N-P coupled node
N97	Refined grain production	sector	Agricultural products processing	N-P coupled node
N98	Milled rice	product	Agricultural products processing	N-P coupled node
N99	Flour	product	Agricultural products processing	N-P coupled node
N100	Rice bran	product	Agricultural products processing	N-P coupled node
N101	Wheat middling and bran	product	Agricultural products processing	N-P coupled node
N102	Rice husk	product	Agricultural products processing	N-P coupled node
N103	Waste of refined grain production	product	Agricultural products processing	N-P coupled node
N104	Coarse grain production	sector	Agricultural products processing	N-P coupled node

N105	Maize	product	Agricultural products processing	N-P coupled node
N106	Cereals	product	Agricultural products processing	N-P coupled node
N107	Cereal husk	product	Agricultural products processing	N-P coupled node
N108	Cereal bran	product	Agricultural products processing	N-P coupled node
N109	Soybean	product	Agricultural products processing	N-P coupled node
N110	Tubers	product	Agricultural products processing	N-P coupled node
N111	Waste of coarse grain production	product	Agricultural products processing	N-P coupled node
N112	Oil production	sector	Agricultural products processing	N-P coupled node
N113	Oil	product	Agricultural products processing	N-P coupled node
N114	Bean cake	product	Agricultural products processing	N-P coupled node
N115	Soybean meal	product	Agricultural products processing	N-P coupled node
N116	Oil cake	product	Agricultural products processing	N-P coupled node
N117	Meat production	sector	Agricultural products processing	N-P coupled node
N118	Pork	product	Agricultural products processing	N-P coupled node
N119	Mutton	product	Agricultural products processing	N-P coupled node
N120	Beef	product	Agricultural products processing	N-P coupled node
N121	Poultry meat	product	Agricultural products processing	N-P coupled node
N122	Horse meat	product	Agricultural products processing	N-P coupled node
N123	Donkey meat	product	Agricultural products processing	N-P coupled node
N124	Slaughter waste water	product	Agricultural products processing	N-P coupled node
N125	Animal leather	product	Agricultural products processing	N-P coupled node
N126	Animal bones	product	Agricultural products processing	N-P coupled node
N127	Vegetables, melons and fruits production	sector	Agricultural products processing	N-P coupled node
N128	Vegetables	product	Agricultural products processing	N-P coupled node
N129	Melons and fruits	product	Agricultural products processing	N-P coupled node
N130	Waste of vegetables, melons and fruits production	product	Agricultural products processing	N-P coupled node
N131	Egg and dairy products production	sector	Agricultural products processing	N-P coupled node
N132	Dairy products	product	Agricultural products processing	N-P coupled node
N133	Egg	product	Agricultural products processing	N-P coupled node
N134	Waste of egg and dairy products production	product	Agricultural products processing	N-P coupled node
N135	Aquatic product production	sector	Agricultural products processing	N-P coupled node
N136	Aquatic products	product	Agricultural products processing	N-P coupled node
N137	Fish Meal	product	Agricultural products processing	N-P coupled node
N138	Waste of aquatic product production	product	Agricultural products processing	N-P coupled node
N139	Sugar production	sector	Agricultural products processing	N-P coupled node
N140	Sugar	product	Agricultural products processing	N-P coupled node

N141	Sugar production waste water	product	Agricultural products processing	N-P coupled node
N142	Sugar production waste utilization	product	Agricultural products processing	N-P coupled node
N143	Waste reprocessing	sector	Agricultural products processing	N-P coupled node
N144	Reusable waste	product	Agricultural products processing	N-P coupled node
N145	Non-reusable waste	product	Agricultural products processing	N-P coupled node
N146	Feed production	sector	Agricultural products processing	N-P coupled node
N147	Livestock feed	product	Agricultural products processing	N-P coupled node
N148	Aquatic feed	product	Agricultural products processing	N-P coupled node
N149	Non-food products production	sector	Agricultural products processing	N-P coupled node
N150	Feed ingredients after processing	product	Agricultural products processing	N-P coupled node
N151	Waste water from non-food products production	product	Agricultural products processing	N-P coupled node
N152	Non-food products	product	Agricultural products processing	N-P coupled node
N153	Urban consumption	sector	Human consumption	N-P coupled node
N154	Excreta from urban household consumption	product	Human consumption	N-P coupled node
N155	Waste water from urban household consumption	product	Human consumption	N-P coupled node
N156	Kitchen waste from urban household consumption	product	Human consumption	N-P coupled node
N157	Other waste from urban household consumption	product	Human consumption	N-P coupled node
N158	Rural consumption	sector	Human consumption	N-P coupled node
N159	Residues of burning straw for energy use in rural areas	product	Human consumption	N-P coupled node
N160	Excreta from rural household consumption	product	Human consumption	N-P coupled node
N161	Waste water from rural household consumption	product	Human consumption	N-P coupled node
N162	Kitchen waste from rural household consumption	product	Human consumption	N-P coupled node
N163	Other waste from rural household consumption	product	Human consumption	N-P coupled node
N164	Industrial waste water treatment	sector	Waste water treatment	N-P coupled node
N165	Effluents from industrial waste water treatment	sector	Waste water treatment	N-P coupled node
N166	Treated waste water from pesticide production	product	Waste water treatment	N-P coupled node
N167	Treated waste water from soap and detergent production	product	Waste water treatment	N-P coupled node
N168	Treated waste water from slaughtering	product	Waste water treatment	N-P coupled node
N169	Treated waste water from sugar production	product	Waste water treatment	N-P coupled node
N170	Treated waste water from other production	product	Waste water treatment	N-P coupled node
N171	Domestic waste water treatment	sector	Waste water treatment	N-P coupled node
N172	Effluents from domestic waste water treatment	product	Waste water treatment	N-P coupled node
N173	Industrial solid waste disposal	sector	Solid waste disposal	N-P coupled node
N174	Accumulation of industrial solid waste	sector	Solid waste disposal	N-P coupled node
N175	Landfill of industrial solid waste	sector	Solid waste disposal	N-P coupled node
N176	Incineration of industrial solid waste	sector	Solid waste disposal	N-P coupled node

N177	Compost of industrial solid waste	sector	Solid waste disposal	N-P coupled node
N178	Domestic solid waste disposal	sector	Solid waste disposal	N-P coupled node
N179	Accumulation of domestic solid waste	sector	Solid waste disposal	N-P coupled node
N180	Landfill of domestic solid waste	sector	Solid waste disposal	N-P coupled node
N181	Incineration of domestic solid waste	sector	Solid waste disposal	N-P coupled node
N182	Compost of domestic solid waste	sector	Solid waste disposal	N-P coupled node
N183	International trade	sector	International trade	N-P coupled node
N184	Stock*	sector	Stock	N-P coupled node
N185	Balancing node	sector	Balancing node	N-P coupled node
N186	P mining and processing	sector	P mining and processing	P-special node
N187	Lager and medium P rocks from mining	product	P mining and processing	P-special node
N188	Small P rocks from mining	product	P mining and processing	P-special node
N189	Raw phosphate rock	product	P mining and processing	P-special node
N190	P concentrates from beneficiation	product	P mining and processing	P-special node
N191	Tailings from beneficiation	product	P mining and processing	P-special node
N192	Waste water from beneficiation	product	P mining and processing	P-special node
N193	P fertilizer production	sector	P chemical production	P-special node
N194	P fertilizer	product	P chemical production	P-special node
N195	Waste water from P fertilizer production	product	P chemical production	P-special node
N196	Phosphogypsum	product	P chemical production	P-special node
N197	Feed additive production	sector	P chemical production	P-special node
N198	Feed additives	product	P chemical production	P-special node
N199	Waste water from feed additive production	product	P chemical production	P-special node
N200	Solid wastes from feed additive production	product	P chemical production	P-special node
N201	Elemental P production	sector	P chemical production	P-special node
N202	Elemental P	product	P chemical production	P-special node
N203	Waste water from elemental P production	product	P chemical production	P-special node
N204	Phosphorus slag from elemental P production	product	P chemical production	P-special node
N205	Ferrophosphorus from elemental P production	product	P chemical production	P-special node
N206	Phosphorus slime from elemental P production	product	P chemical production	P-special node
N207	Pesticide production	sector	P chemical production	P-special node
N208	Detergent production	sector	P chemical production	P-special node
N209	Other P chemical production	sector	P chemical production	P-special node
N210	Waste water of oil extraction	product	P-related waste water from household consumption	P-special node
N211	Solid waste from non-food products production	product	P-related waste water from household consumption	P-special node
N212	Treated waste water from beneficiation production	product	P-related waste water treatment	P-special node

N213	Treated waste water from P fertilizer production	product	P-related waste water treatment	P-special node
N214	Treated waste water from feed additive production	product	P-related waste water treatment	P-special node
N215	Treated waste water from elemental P production	product	P-related waste water treatment	P-special node
N216	Treated waste water from oil production	product	P-related waste water treatment	P-special node
N217	Sludge from industrial waste water treatment	sector	P-related waste water treatment	P-special node
N218	Sludge from waste water treatment in beneficiation production	product	P-related waste water treatment	P-special node
N219	Sludge from waste water treatment in P fertilizer production	product	P-related waste water treatment	P-special node
N220	Sludge from waste water treatment in feed additive production	product	P-related waste water treatment	P-special node
N221	Sludge from waste water treatment in elemental P production	product	P-related waste water treatment	P-special node
N222	Sludge from waste water treatment in pesticide production	product	P-related waste water treatment	P-special node
N223	Sludge from waste water treatment in soap and detergent production	product	P-related waste water treatment	P-special node
N224	Sludge from waste water treatment in oil production	product	P-related waste water treatment	P-special node
N225	Sludge from waste water treatment in slaughtering	product	P-related waste water treatment	P-special node
N226	Sludge from waste water treatment in sugar production	product	P-related waste water treatment	P-special node
N227	Sludge from waste water treatment in other production	product	P-related waste water treatment	P-special node
N228	Sludge from the treatment of domestic waste water	product	P-related waste water treatment	P-special node
N229	Agricultural energy consumption	product	Agricultural energy consumption	N-special node
N230	Synthetic ammonia production	sector	N chemical production	N-special node
N231	Synthetic ammonia	product	N chemical production	N-special node
N232	Waste water from synthetic ammonia production	product	N chemical production	N-special node
N233	Waste gas from synthetic ammonia production	product	N chemical production	N-special node
N234	N fertilizer production	sector	N chemical production	N-special node
N235	N fertilizer	product	N chemical production	N-special node
N236	Waste water from nitrogen fertilizer production	product	N chemical production	N-special node
N237	Waste gas from nitrogen fertilizer production	product	N chemical production	N-special node
N238	Nitrogen-containing industrial products production	sector	N chemical production	N-special node
N239	Chemical medicament	product	N chemical production	N-special node
N240	Industrial explosives	product	N chemical production	N-special node
N241	Caprolactam	product	N chemical production	N-special node
N242	Primary form of plastic	product	N chemical production	N-special node
N243	Natural rubber	product	N chemical production	N-special node
N244	Synthetic rubber	product	N chemical production	N-special node
N245	Synthetic fiber	product	N chemical production	N-special node
N246	Waste water from chemical medicament production	product	N chemical production	N-special node
N247	Waste water from natural rubber and synthetic rubber production	product	N chemical production	N-special node
N248	Waste water from synthetic fiber production	product	N chemical production	N-special node

N249	Waste water from other production	product	N chemical production	N-special node
N250	Solid waste from industrial production	product	N chemical production	N-special node
N251	Waste gas from industrial production	product	N chemical production	N-special node
N252	Waste gas from non-food products production	product	N chemical production	N-special node
N253	Urban human metabolism	product	N-related emission from household consumption	N-special node
N254	Energy consumption waste gas from urban household consumption	product	N-related emission from household consumption	N-special node
N255	Rural human metabolism	product	N-related emission from household consumption	N-special node
N256	Energy consumption waste gas from rural household consumption	product	N-related emission from household consumption	N-special node
N257	Treated waste water from synthetic ammonia production	product	N-related waste water treatment	N-special node
N258	Treated waste water from nitrogen fertilizer production	product	N-related waste water treatment	N-special node
N259	Treated waste water from chemical medicament production	product	N-related waste water treatment	N-special node
N260	Treated waste water from natural rubber and synthetic rubber production	product	N-related waste water treatment	N-special node
N261	Treated waste water from synthetic fiber production	product	N-related waste water treatment	N-special node
N262	Gas emissions after industrial waste water treatment	product	N-related waste water treatment	N-special node
N263	Gas emissions after domestic waste water treatment	product	N-related waste water treatment	N-special node
N264	Gas emission after industrial solid waste accumulation treatment	product	N-related solid waste disposal	N-special node
N265	Solid discharge after industrial solid waste accumulation treatment	product	N-related solid waste disposal	N-special node
N266	Liquid discharge after industrial solid waste accumulation treatment	product	N-related solid waste disposal	N-special node
N267	Gas emission after industrial solid waste landfill treatment	product	N-related solid waste disposal	N-special node
N268	Solid discharge after industrial solid waste landfill treatment	product	N-related solid waste disposal	N-special node
N269	Liquid discharge after industrial solid waste landfill treatment	product	N-related solid waste disposal	N-special node
N270	Gas emission after industrial solid waste incineration treatment	product	N-related solid waste disposal	N-special node
N271	Gas emission after industrial solid waste compost treatment	product	N-related solid waste disposal	N-special node
N272	Solid discharge after industrial solid waste compost treatment	product	N-related solid waste disposal	N-special node
N273	Liquid discharge after industrial solid waste compost treatment	product	N-related solid waste disposal	N-special node
N274	Gas emission after domestic solid waste accumulation treatment	product	N-related solid waste disposal	N-special node
N275	Solid discharge after domestic solid waste accumulation treatment	product	N-related solid waste disposal	N-special node
N276	Liquid discharge after domestic solid waste accumulation treatment	product	N-related solid waste disposal	N-special node
N277	Gas emission after domestic solid waste landfill treatment	product	N-related solid waste disposal	N-special node
N278	Solid discharge after domestic solid waste landfill treatment	product	N-related solid waste disposal	N-special node
N279	Liquid discharge after domestic solid waste landfill treatment	product	N-related solid waste disposal	N-special node
N280	Gas emission after domestic solid waste incineration treatment	product	N-related solid waste disposal	N-special node
N281	Gas emission after domestic solid waste compost treatment	product	N-related solid waste disposal	N-special node
N282	Solid discharge after domestic solid waste compost treatment	product	N-related solid waste disposal	N-special node
N283	Liquid discharge after domestic solid waste compost treatment	product	N-related solid waste disposal	N-special node

Note: Stock is a terminology from material flow analysis, which refers to both in-use stock (e.g., animals, human beings, etc.) and product inventories (e.g., P rock inventory).