Supplementary Information for "Measuring China's Policy Stringency on Climate Change for 1954-2022"

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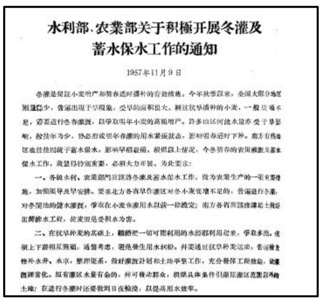
Contents:

Table S1. Multi-source data standardization

Original format			After standardization
PDFs	202222846_The Notice of the National Development and Reform Commission and The National Energy Administration on The Implementation Plan for Promoting the High-Quality Development of New Energy in The New Era. The Notice on Promoting the High-Quality Development of New Energy in The New Era.		
PDFs that contain traditional Chinese text	195500277_Resolution of the State Council on The Report on The Comprehensive Plan to Eradicate Water Hazards in The Yellow River and Develop Water Conservancy in The Yellow River	 關於根治黃河水害和開發黃河水利的綜合規劃的報告	
PDFs with images or scanned pages /JPGs	195701249_Instructions of the State Council on Strengthening Coal Mine Leadership, Unleashing Production Potential, Increasing Coal Production and Vigorously Saving Coal Use	 水利部.农業部关于积極开展冬灌及蓄水保水工作的通知 1957年11月9日	

DOCs	199106598_Reply of The State Council on China’s Accession to The Amended Montreal Protocol on Substances That Deplete the Ozone Layer	 国务院关于我国加入经修正的 《关于消耗臭氧层的物质的蒙特利尔 议定书》的批复 国函〔1991〕23号 国家环保局、外交部、国家计委、国家科委、化工部、轻工部、机电部、商业部、公安部： 国务院决定，我国加入经修正的《关于消耗臭氧层的物质的蒙特利尔议定书》。加入该议定书的通知手续由外交部办理。 —766— (C)1994-2023 China Academic Journal Electronic Publishing House. All rights reserved. http://www.cnki 关于我国加入该议定书后应做的工作，国务院同意你们的意见。各有关部门应当在各自职责范围内分工协作，负责实施。有关日常事宜由国家环保局组织。 国 务 院 一九九一年五月一日	

Table S2. Overview of mapping relationship for feature lexicon

Tier I	Tier II	Tier III	Word density
Mitigation	Energy	Energy Systems - Mitigation	99
Mitigation	Energy	Wind Energy	33
Mitigation	Energy	Solar Energy	28
Mitigation	Energy	Bioelectricity	21
Mitigation	Energy	Hydropower	28
Mitigation	Energy	Geothermal Energy	13
Mitigation	Energy	Nuclear Energy	18
Mitigation	Energy	Carbon Capture And Storage (CCS)	31
Mitigation	Energy	Coal Phase Down	37
Mitigation	Energy	Reduce Ch4 Emission From Coal Mining, Oil And Gas	14
Mitigation	Energy	Carbon Sequestration In Agriculture	14
Mitigation	Energy	Reduce Ch4 And N2O Emission In Agriculture	26
Mitigation	Energy	Reduced Conversion Of Forests And Other Ecosystems	24
Mitigation	AFOLU	Ecosystem Restoration, Afforestation, Reforestation	46
Mitigation	AFOLU	Improved Sustainable Forest Management	10
Mitigation	AFOLU	Reduce Food Loss And Food Waste	24
Mitigation	AFOLU	Shift To Balanced, Sustainable Healthy Diets	23
Mitigation	Buildings	Avoid Demand For Energy Services	15
Mitigation	Buildings	Efficient Lighting, Appliances And Equipment	22
Mitigation	Buildings	New Buildings With High Energy Performance	24
Mitigation	Buildings	Onsite Renewable Production And Use	15
Mitigation	Buildings	Improvement Of Existing Building Stock	8
Mitigation	Buildings	Enhanced Use Of Wood Products	4
Mitigation	Transport	Fuel-Efficient Light-Duty Vehicles	17
Mitigation	Transport	Electric Light-Duty Vehicles	4
Mitigation	Transport	Shift To Public Transportation	9
Mitigation	Transport	Shift To Bikes And E-Bikes	10
Mitigation	Transport	Fuel-Efficient Heavy-Duty Vehicles	6
Mitigation	Transport	Electric Heavy-Duty Vehicles, Incl. Buses	3

Mitigation	Transport	Shipping – Efficiency And Optimization	24
Mitigation	Transport	Aviation – Energy Efficiency	7
Mitigation	Transport	Biofuels	1
Mitigation	Industry	Industry Systems	35
Mitigation	Industry	Energy Efficiency	30
Mitigation	Industry	Material Efficiency	45
Mitigation	Industry	Enhanced Recycling	35
Mitigation	Industry	Fuel Switching (Electr, Nat. Gas, Bio-Energy, H2)	10
Mitigation	Industry	Feedstock Decarbonization, Process change	26
Mitigation	Industry	Carbon Capture With Utilization (CCU) And CCS	9
Mitigation	Industry	Cementitious Material Substitution	14
Mitigation	Industry	Reduction Of Non-Co2 Emissions	10
Mitigation	Urban Systems	Urban Land Use And Spatial Planning	36
Mitigation	Urban Systems	Electrification Of The Urban Energy System	10
Mitigation	Urban Systems	District Heating And Cooling Networks	13
Mitigation	Urban Systems	Urban Green And Blue Infrastructure	38
Mitigation	Urban Systems	Waste Prevention, Minimization And Management	22
Mitigation	Urban Systems	Integrating Sectors, Strategies And Innovations	50
Mitigation	Other	Reduce Emission Of Fluorinated Gas	12
Mitigation	Other	Reduce Ch4 Emissions From Solid Waste	10
Mitigation	Other	Reduce Ch4 Emissions From Wastewater	3
Adaption	Land And Ocean Ecosystems	Coastal Defence And Hardening	57
Adaption	Land And Ocean Ecosystems	Integrated Costal Zone Management	31
Adaption	Land And Ocean Ecosystems	Forest-Based Adaptation	24
Adaption	Land And Ocean Ecosystems	Sustainable Aquaculture And Fisheries	13
Adaption	Land And Ocean Ecosystems	Agroforestry	44
Adaption	Land And Ocean Ecosystems	Biodiversity Management And Ecosystem Connectivity	15

Adaption	Land And Ocean Ecosystems	Water Use Efficiency And Water Resource Management	32
Adaption	Land And Ocean Ecosystems	Improved Cropland Management	23
Adaption	Land And Ocean Ecosystems	Efficient Livestock Systems	18
Adaption	Urban And Infrastructure Systems	Green Infrastructure And Ecosystem Services	16
Adaption	Urban And Infrastructure Systems	Sustainable Land Use And Urban Planning	30
Adaption	Urban And Infrastructure Systems	Sustainable Urban Water Management	18
Adaption	Energy Systems	Improve Water Use Efficiency	28
Adaption	Energy Systems	Resilient Power Systems	16
Adaption	Energy Systems	Energy Reliability	9
Adaption	Cross-sectoral	Health And Health Systems Adaptation	22
Adaption	Cross-sectoral	Livelihood Diversification	16
Adaption	Cross-sectoral	Planned Relocation And Resettlement	10
Adaption	Cross-sectoral	Human Migration	12
Adaption	Cross-sectoral	Disaster Risk Management	34
Adaption	Cross-sectoral	Climate Services, Including Early Warming Systems	42
Adaption	Cross-sectoral	Social Safety Nets	21
Adaption	Cross-sectoral	Risk Spreading And Sharing	20
Implementation	Consistent	--	94
Implementation	Permissive	--	57
Implementation	Stringent	--	19
Spatial Difference	Universal	--	10
Spatial Difference	Regional	--	41
Spatial Difference	Provincial	--	33
Spatial Difference	Prefecture	--	333

Table S3. Multi-layered lexicon built-up and selection evidence

Tier-I			Tier-II	Tier-III	Reference
1	Mitigation	1	Energy	Energy Systems	(Rezazadeh and Avami, 2024)
				Wind Energy	(Giani et al., 2020)
				Solar Energy	(Kabir et al., 2018)
				Bio-electricity	(Intamano et al., 2024)
				Hydro-power	(Lu et al., 2020)
				Geothermal Energy	(Shah et al., 2023)
				Nuclear Energy	(Guénand et al., 2024)
				Carbon Capture And Storage (CCS)	(Fan et al., 2024)
				Coal Phase Down	(Walk and Stognief, 2022)
				Reduce Ch4 Emission From Coal Mining, Oil And Gas	(Karacan et al., 2024)
		2	AFOLU	Carbon Sequestration In Agriculture	(Nazir et al., 2024)
				Reduce Ch4 And N2O Emission In Agriculture	(Pence et al., 2024)
				Reduced Conversion Of Forests And Other Ecosystems	(He et al., 2024)
				Ecosystem Restoration, Affectation, Reforestation	(Song et al., 2023)
				Improved Sustainable Forest Management	(Wessely et al., 2024)
				Reduce Food Loss And Food Waste	(Shigetomi et al., 2024)
				Shift To Balanced, Sustainable Healthy Diets	(Li et al., 2024)
		3	Buildings	Avoid Demand For Energy Services	(González-Cruz, 2024)
				Efficient Lighting, Appliances And	

				Equipment	
				New Buildings With High Energy Performance	
				Onsite Renewable Production And Use	
				Improvement Of Existing Building Stock	
				Enhanced Use Of Wood Products	(Xue et al., 2024)
		4	Transport	Fuel-Efficient Light-Duty Vehicles	(McCollum et al., 2018)
				Electric Light-Duty Vehicles	
				Shift To Public Transportation	(Tian et al., 2024)
				Shift To Bikes And E-Bikes	
				Fuel-Efficient Heavy-Duty Vehicles	(McCollum et al., 2018)
				Electric Heavy-Duty Vehicles, Incl. Buses	
				Shipping – Efficiency And Optimization	(Müller-Casseres et al., 2024)
				Aviation – Energy Efficiency	(Rao et al., 2024)
				Biofuels	(Bouter et al., 2024)
		5	Industry	Industry Systems	(Intamano et al., 2024)
				Energy Efficiency	(Reyna and Chester, 2017)
				Material Efficiency	(J. Chen et al., 2024)
				Enhanced Recycling	
				Fuel Switching (Electr, Nat. Gas, Bio-Energy, H2)	(Giani et al., 2020)
				Feedstock Decarbonization, process change	(Rezazadeh and Avami, 2024)
				Carbon Capture With Utilization	(Fan et al., 2024)

				(CCU) And CCS	
				Cementitious Material Substitution	(Van Roijen et al., 2024)
				Reduction Of Non-CO2 Emissions	(Takane et al., 2023)
		6	Social & Economy System and Innovation	Urban Land Use And Spatial Planning	(Intamano et al., 2024)
				Electrification Of The Urban Energy System	(Wu et al., 2024)
				District Heating And Cooling Networks	(Liu et al., 2024)
				Urban Green And Blue Infrastructure	(Liu et al., 2024)
				Waste Prevention, Minimization And Management	(Shigetomi et al., 2024)
				Integrating Sectors, Strategies And Innovations	(Esposito et al., 2024)
		7	Other	Reduce Emission Of Fluorinated Gas	(Guo et al., 2023)
				Reduce Ch4 Emissions From Solid Waste	(Rao et al., 2024)
				Reduce Ch4 Emissions From Wastewater	
2	Adaption	8	Land And Ocean Ecosystems	Coastal Defense And Hardening	(Wannewitz et al., 2024)
				Integrated Coastal Zone Management	
				Forest-Based Adaptation	(He et al., 2024)
				Sustainable Aquaculture And Fisheries	(Lynch et al., 2024)
				Agroforestry	(Nazir et al., 2024)
				Biodiversity Management And Ecosystem	(P. Chen et al., 2024)

				Connectivity	
				Water Use Efficiency And Water Resource Management	(J. Chen et al., 2024)
				Improved Cropland Management	(Gu et al., 2024)
				Efficient Livestock Systems	
		9	Urban And Infrastructure Systems	Green Infrastructure And Ecosystem Services	(Liu et al., 2024)
				Sustainable Land Use And Urban Planning	(Gao and Bukovsky, 2023)
				Sustainable Urban Water Management	(J. Chen et al., 2024)
		10	Energy Systems	Improve Water Use Efficiency	(J. Chen et al., 2024)
				Resilient Power Systems	(Yang et al., 2024)
				Energy Reliability	
		11	Cross-sectoral	Health And Health Systems Adaptation	(Park et al., 2024)
				Livelihood Diversification	(Bower et al., 2023)
				Planned Relocation And Resettlement	
				Human Migration	
				Disaster Risk Management	(Ackerl et al., 2023)
				Climate Services, Including Early Warming Systems	(Rodríguez-Moreno et al., 2024)
				Social Safety Nets	(Lorig et al., 2024)
				Risk Spreading And Sharing	(Hueholt et al., 2024)
3	Implementation				(Rezazadeh and Avami, 2024)
4	Spatial Difference				(Liu et al., 2024)

Table S4. Prompt design for policy filtering task

Our policy filtering prompt methodology incorporates Chain-of-Thought (COT) reasoning, instruction learning and few shoots within a structured framework. The prompt architecture begins with a system message that delineates a three-step COT process, facilitating systematic policy evaluation. This sequence guides the language model through: (1) identifying primary policy intentions, (2) analyzing potential unintended climate effects, including policy spillovers, and (3) synthesizing these elements to determine classification based on IPCC mitigation and adaptation categories.

The prompt structure integrates comprehensive instructions derived from IPCC frameworks for climate mitigation and adaptation. These guidelines establish precise criteria for identifying climate-relevant policies while delineating specific exclusions, such as policies centered on education, cultural initiatives, or administrative reforms that lack direct connections to climate-critical sectors like energy or natural resources. This framework enables systematic differentiation between with potential countering climate change (1) and non-potential countering climate change (0) policies.

To enhance the model's classification accuracy, we incorporated policy titles that demonstrate the application of classification principles across diverse scenarios. This few-shot learning approach provides concrete examples that illustrate the precise distinctions between relevant and irrelevant policies, thereby strengthening the model's contextual understanding and classification capabilities.

The prompt design constrains output to binary classification (1 or 0) without supplementary explanation, ensuring output consistency and interpretability. This deliberate constraint optimizes result clarity while eliminating extraneous information that could impede analysis. The methodology synthesizes structured reasoning, targeted instruction, and example-based learning to achieve precise policy classification based on climate relevance.

```
def analyze_policy_title(policy_title):

    messages = [

        {

            "role": "system",

            "content": "This is the general Chain of Thought (COT):\n
```

Step 1: Understand the policy intention within the title to assess whether it includes potential climate change mitigation or adaptation effects.\n

Step 2: Identify any unintended effects of the policy, especially for those policies not directly related to climate (e.g., policies designed for other purposes but having positive or negative spillover effects on climate). Determine if these policies have significant indirect climate effects.\n

Step 3: Synthesize the analyses from Steps 1 and 2, and refer to the IPCC's list of climate mitigation and adaptation measures (which includes 50 subcategories for mitigation such as energy systems, wind energy, solar energy, bioelectricity, hydropower, geothermal energy, nuclear energy, carbon capture and storage (CCS), coal phase-out, reducing CH4 emissions from coal mining, oil, and gas; and 23 subcategories for adaptation such as coastal defense, integrated coastal zone management, forest-based adaptation, sustainable aquaculture, agroforestry, biodiversity management, efficient livestock systems, green infrastructure, resilient power systems, health and adaptation of health systems, disaster risk management, etc.) to make a final judgment.\n\n

If the policy explicitly concerns education, cultural development, personnel appointments, organizational restructuring, international treaties, administration, administrative adjustments, finance, legal restructuring, social security, poverty alleviation, foreign trade, diplomacy, or civil rights without direct relevance to sectors like energy, agriculture, transport, or natural resources, categorize it as '0'.\n\n

Based on the above criteria, judge whether the policy has climate change mitigation or adaptation effects and assign a category. Here are some typical examples: \n

- Emergency notice on ensuring livestock safety through winter and spring // 0\n\n

- Comprehensive planning report for the eradication of Yellow River water hazards and development of water conservancy // 1\n

- Tax Collection Administration Law of the People's Republic of China // 0\n

- Personnel appointments and removals by the State Council of the People's Republic of China // 0\n

- Notification on the Twelfth Five-Year Plan for the Development of National Education by the Ministry of Education // 0\n

- Notice on several tax policies for business culture units undergoing reform in the cultural system // 0\n

- Large-scale afforestation directive by the Central Committee of the Communist Party of China and the State Council // 1\n

- Notification on the development of small hydropower projects in rural electrification pilot counties // 1\n

- Ordinance on Meteorological Disaster Prevention // 1\n

- Action Plan for Carbon Peak by 2030 issued by the State Council // 1\n

- Report on the Ten-Year Plan for National Economic and Social Development and the Eighth Five-Year Plan Outline // 1\n

- Notification on strengthening the protection of power facilities // 1\n

- Urban Water Supply Regulations // 1\n

- Notification on flood control for small reservoir projects by the Ministry of Agriculture // 1\n

- Instruction on preventing high temperatures in summer by the First Ministry of Machine-Building Industry // 1\n

- Ten regulations on gas control in coal mines by the State Administration of Work Safety // 1\n

- Pilot Program for Provincial Spatial Planning issued by the General Office of the CPC Central Committee and the General Office of the State Council // 1\n

- Grassland Law of the People's Republic of China issued by the President // 1\n

- Notification on stabilizing forest tenure and implementing forestry production responsibility system // 1\n

- Announcement on the trial measures for coal resource tax collection management // 1\n

- Notification on the report of the National Irrigation Management Work Conference // 1\n

- Notification on strengthening basic farmland construction in poverty-stricken areas // 1\n

- Decision on the exclusive operation of fertilizers, pesticides, and agricultural films // 1\n

- Coal Business Management Measures // 1\n

```
- Environmental Status Report of China (Summary) by the Environmental Protection Agency // 1\n

- Notification on adjusting national nature reserves in Hebei Province // 0\n

- Notification on strengthening the protection and management of ancient buildings and cultural relics // 0\n

- Several opinions on promoting seismic isolation technology in building engineering // 0\n

- Reply on the master plan of Qingdao city // 0"

            },

            {

                  "role": "user",

                  "content": f"This is the policy title provided by the user: \"{policy_title}\"\n\nRequirement: Return only the judgment result as '1' or '0', without explanation or discussion."

            }

      ]



      tokens_used = num_tokens_from_messages(messages, model="gpt-4o")



      response = client.chat.completions.create(

            model="gpt-4o",

            messages=messages,

            temperature=1,

            max_tokens=256,

            top_p=1,
```

```
        frequency_penalty=0,

        presence_penalty=0

    )



    response_message = response.choices[0].message.content



    return response_message, tokens_used
```

Table S5. Prompt usage of policy instrument classification task

Our prompt design for policy instrument classification implements a systematic methodology that integrates sequential reasoning processes, comprehensive instructional frameworks, and exemplar-based guidance. This structure enhances model performance in distinguishing among Command-and-Control, Market-Based Incentive, and Voluntary Instrument policies. The methodology employs Chain of Thought reasoning through explicit step-by-step instructions, directing the model to conduct systematic analysis by first identifying key linguistic indicators before establishing correlations with specific policy categories.

The framework incorporates detailed categorical definitions and linguistic parameters for each policy type. Command-and-Control policies are characterized by mandatory linguistic markers such as "must" or "enforce," while Market-Based Incentives are identified through economic terminology including "subsidy" or "compensation." The classification framework accounts for contextual nuances, such as the designation of policies containing "guiding opinions" as Command-and-Control instruments, regardless of the absence of explicit enforcement terminology. This structured approach facilitates consistent interpretation of linguistic subtleties.

To enhance classification accuracy, the methodology implements few-shot learning through carefully selected exemplars that demonstrate various policy classifications and their associated complexities. These examples serve as reference points, enabling the model to establish robust pattern recognition and improve classification accuracy across diverse policy contexts.

The output protocol is streamlined to generate singular classification labels (1, 2, or 3), eliminating superfluous explanatory content. This constraint optimizes response clarity and facilitates efficient downstream processing. The integration of structured reasoning, comprehensive instructional parameters, contextual examples, and simplified output formatting creates a robust framework for accurate policy instrument classification.

```
def analyze_policy_title(policy_title):



    messages = [

        {

            "role": "system",
```

"content": "Please think step by step. Your task is to analyze and classify the policy type based on the features of the provided Chinese text.\n\

The policy types include:\n\

Command-and-Control Instruments (CCI): These policies contain mandatory regulations, laws, enforcement actions, or prohibitions imposed by authorities. Keywords include:\n\

Regulatory terms: regulation, ordinance, measure, management approach, interim regulation, implementation details.\n\

Mandatory expressions: must, prohibit, forbid, strictly forbid, enforce, require, command, urgent notice.\n\

Enforcement actions: enforcement, investigation, penalty, accountability, supervision and management.\n\

Industry supervision and enforcement: Policies that explicitly require supervision or compulsory measures, especially targeting specific industries and resource management.\n\

Natural resource management: protection, management, conservation, resource, development, prevention, forest, land, water resources.\n\

Explicit plans or implementation schemes: Policies that include specific implementation plans, management measures, or schedules, indicating enforceability, such as Five-Year Plans, national economic plans, policy guidelines, government work reports.\n\

Government decisions and commands: Any compulsory decisions or directives issued by the State Council, the Central Committee, the National Development and Reform Commission, or other high-level government agencies.\n\

Natural resource management: Involves the development, protection, conservation, or prevention of natural resources (e.g., forests, land, water resources).\n\n\

Market-Based Incentives (MXI): These policies use economic incentives or penalties to influence behavior. Keywords include:\n\

Financial-related: funding management, special funds, subsidies, grants, funds, rewards, compensation, price reform, taxes, fees, collection, paid use, financial services, credit.\n\

Trade mechanisms: emission trading, carbon emission rights trading, water rights reform, trading mechanism.\n\

Price adjustments: electricity price, water price, pollution fees, price subsidies, price reform, ecological compensation.\n

Resource management: resource tax, resource fee, paid use of resources, mineral resources, water resource tax, resource conservation, mine rehabilitation and governance, energy conservation and emissions reduction.\n

Environmental damage compensation: damage compensation fund, ecological damage compensation, compensation mechanism.\n\n

Voluntary Instruments (VOI): These policies encourage public participation, education, information disclosure, publicity activities, and leadership speeches. Keywords include:\n

Public participation: involvement, public participation, publicity activities, education.\n

Information disclosure: environmental information disclosure, information release, environmental impact assessment, publication of reports.\n

Leadership speeches or advocacy: speeches by national leaders, addresses, congratulatory messages, advocacy.\n

Activity promotion: energy-saving campaigns, awareness week, energy-saving month, conferences, afforestation campaigns, food-saving publicity.\n

Note: Policies primarily related to information disclosure or disclosure regulations should be classified as Voluntary Instruments (VOI).\n\n

Please determine which category each policy falls into.\n\n

Use the following guidelines for classification:\n\n

Command-and-Control Instruments (CCI): return 1.\n

Market-Based Incentives (MXI): return 2.\n

Voluntary Instruments (VOI): return 3.\n\n

Here are some special rules:\n

1) If a policy includes keywords like encouragement or guiding opinions without other types of keywords, it should still be classified as Command-and-Control Instruments (CCI).\n\n

2) The following policies belong to Command-and-Control Instruments (CCI), not Voluntary Instruments (VOI):\n\n...

```
        },
        {
            "role": "user",
            "content": f"Evaluate the following policy title: \"{policy_title}\". Requirement: Return only the classification result: 1, 2, or 3, without explanation or discussion."
        }
    ]

    tokens_used = num_tokens_from_messages(messages, model="gpt-4o")

    response = client.chat.completions.create(
        model="gpt-4o",
        messages=messages,
        temperature=1,
        max_tokens=256,
        top_p=1,
        frequency_penalty=0,
        presence_penalty=0
    )

    response_message = response.choices[0].message.content
```

```
    return response_message, tokens_used
```

Table S6. The rating criteria for policy measure

Feasibility of Policy Measures	Description	Quantitative Score
Detailed	To establish detailed implementation standards and targets, set clear timelines and outline specific rewards and penalties.	5 points
General	To establish precise execution targets and implementation standards but without defined incentives and timelines.	3 points
Mentioned	There are no clear implementation standards, specific targets, rewards, timelines and punitive measures; it merely mentions these elements without detailed elaboration.	1 point

Table S7. The rating criteria for policy objective

Clarity of Policy Objectives	Description	Quantitative Score
Detailed	To develop precise implementation plans, establish standards, and formulate support measures.	5 points
General	To establish ambiguous implementation plans, access standards, and measures.	3 points
Mentioned	The policy encompasses the specified content but lacks the formulation of relevant measures and methods.	1 point

Table S8. The rating criteria for policy implementation

The Level of Policy Implementation	Description	Quantitative Score
Stringent	The policy content and title mainly use words like: 'resolutely contain, resolutely stop, must not in any case, one-size-fit-all, the strictest,' and others.	5 points
Consistent	The policy content and title mainly use words like: 'accelerate construction, orderly elimination, actively promote, orderly development, gradually adjust,' and others.	3 points
Permissive	The policy content and title mainly use words like: 'rational layout, rational control, actively expand, dynamic monitoring, small scale,' and others.	1 point

Table S9. The machine learning model evaluation metrics

	RMSE		MAE	
	Training	Testing	Training	Testing
Lm	79.32	35.88	29.55	23.42
Lasso	40.94	33.47	23.76	22.93
ElasticNet	43.16	33.45	24.38	23.19
SVM	28.43	33.78	21.58	23.39
Rf	24.40	26.98	18.78	19.13
Cubist	26.69	28.97	20.37	20.38
Gbm	25.53	27.18	19.44	19.87
BagEarth	27.25	32.82	21.41	23.84

Table S10. The typical examples of policies in the PSCC policy pool with objectives not primarily focused on climate change

<table>
<tr><td>ID</td><td>Examples</td></tr>
<tr><td rowspan="2">1</td><td>Uid-202223081-Modern Energy System Planning for the 14th Five-Year Plan

Category:Mitigation_Energy_Energy Systems

Core Policy Objective:
This plan is prepared in accordance with the "Outline of the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Long-Range Objectives Through the Year 2035", which mainly clarifies the policy, main objectives and tasks of China's energy development, and is the overall blueprint and action plan for accelerating the construction of a modern energy system and promoting high-quality energy development during the "14th Five-Year Plan" period.</td></tr>
<tr><td>Policy content:
Enhance the stability and security of the energy supply chain;
Accelerate the green and low-carbon transformation of energy;
Optimize the layout of energy development;
improve the modernization level of the energy industry chain;
Enhance the efficiency of energy governance;
Build a new pattern of open and win-win energy cooperation;
Strengthen the implementation and management of planning
Climate change related policy content:
The uploaded policy will have positive climate effects by eliminating outdated production capacities, advancing cleaner technologies, optimizing industrial structures, and preventing uncontrolled investment in overcapacity industries, thus reducing energy consumption and emissions and improving environmental protection and resource efficiency.</td></tr>
<tr><td rowspan="2">2</td><td>Uid-200613528-Notice of the State Council on Accelerating the Structural Adjustment of Industries with Overcapacity

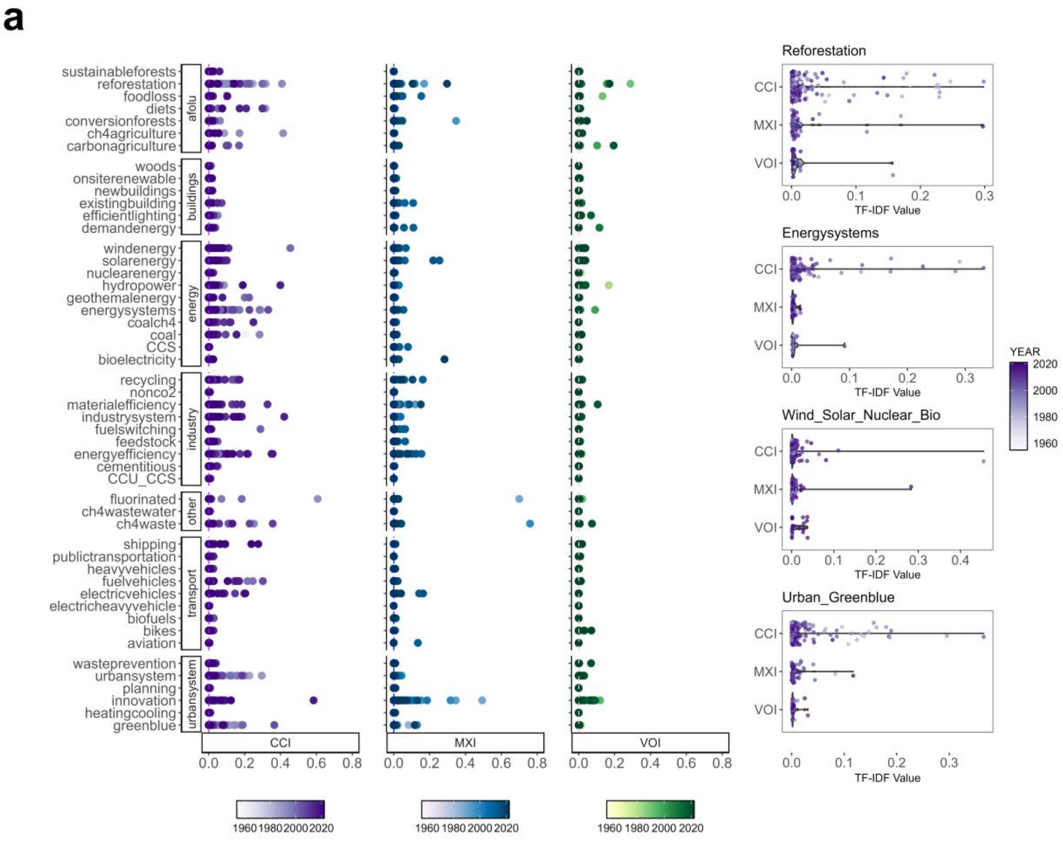
Category:

Core Policy Objective:
In order to solve the problem of overcapacity caused by blind investment and low-level expansion in some industries, prevent the contradiction of irrational industrial structure from further aggravating, affect the sustained, rapid, coordinated and healthy development of the economy, and accelerate the structural adjustment of industries with excess capacity.</td></tr>
<tr><td>Policy content:
The importance and urgency of accelerating the structural adjustment of industries</td></tr>
</table>

	with excess capacity; ● Effectively prevent the rebound of investment in fixed assets; ● Strictly control new projects; ● Fourth, the elimination of backward production capacity; ● Promote technological transformation; ● Promote mergers and acquisitions; ● Strengthen the coordination and cooperation between credit, land, construction, environmental protection, safety and other policies and industrial policies; ● Deepen the reform of the administrative and investment system, price formation and market exit mechanism; ● Improve the industry information release system Climate change positive effects: This policy will have positive climate effects by eliminating inefficient and high-pollution production capacities, promoting cleaner technologies, and encouraging the optimization of industrial structures, thereby reducing energy consumption and emissions associated with overcapacity industries.
3	Uid-199307330-Notice of the State Council on strengthening soil and water conservation work Category: Adaption_Land And Ocean Ecosystems_Coastal Defense And Hardening Core Policy Objective: In order to fundamentally improve the conditions for agricultural production and promote the development of the national economy, we should give play to the role of soil erosion control in speeding up poverty alleviation and prosperity in impoverished mountainous areas, protecting the national land, and improving the ecological environment.
	Policy content: ● Enhance the scientific understanding and sense of urgency of soil erosion; ● Conscientiously implement the "Law of the People's Republic of China on Soil and Water Conservation"; ● Increase investment in multiple forms and channels, and vigorously carry out soil and water conservation; ● Formulate soil and water conservation plans and plans for the region and industry. Climate change positive effects: This policy will have positive climate adaptation effects by enhancing soil and water conservation efforts, which improve agricultural production conditions and the ecological environment. Such measures can reduce soil erosion and increase land productivity, thereby strengthening regional resilience to climate change.

Figure S1. The decomposition of PSCC values over time under Tier-III dimensions

The Decomposition of PSCC Values over time under Tier-III Dimensions. Plot (a) illustrates the decomposition of PSCC values across the mitigation dimension, integrating policy types like CCI, MXI, and VOI. The x-axis denotes PSCC values, while the y-axis lists the Tier-III sub-dimensions referenced in Figure 3 in the manuscript. Point coloration corresponds to annual scores per policy type. The detailed plots on the right explore dimensions such as Reforestation and Urban Greenblue, with the x-axis showing PSCC values and the y-axis grouping policies by the categorizations in Policy categorization section, color-coded by year. Plot (b), adopting the same axes and color scheme, displays the adaptation dimension's PSCC values, facilitating a direct comparison between the two strategies' evolution over time.



b

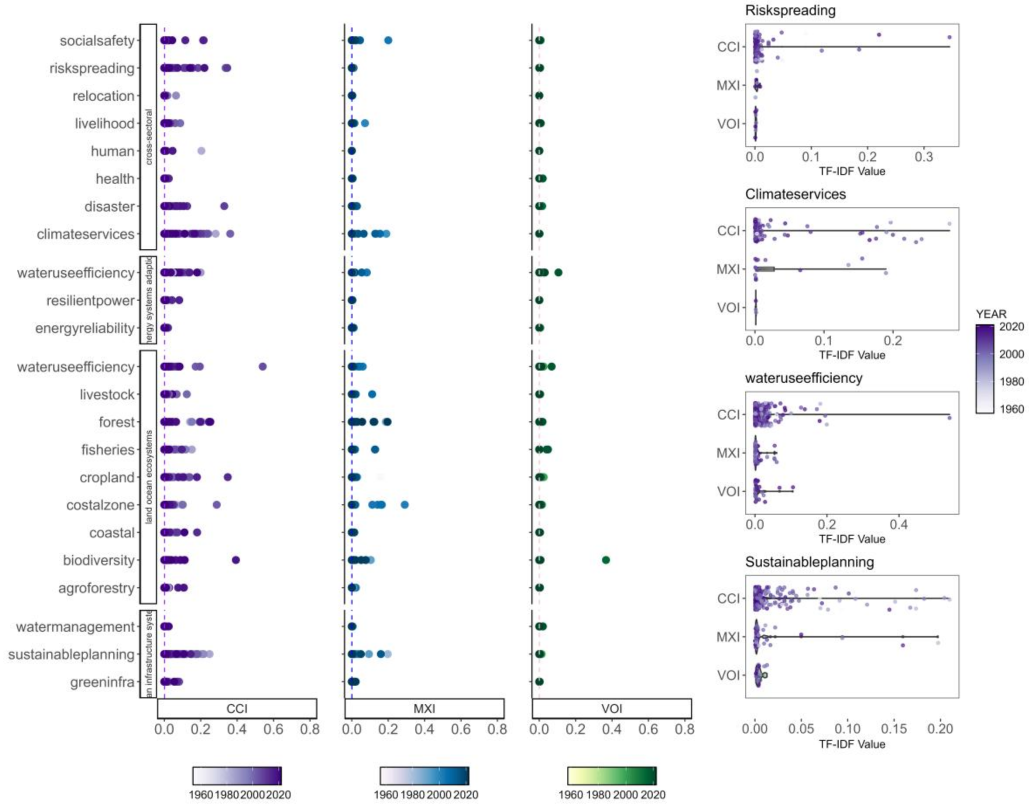

socialsafety
riskspreading
relocation
livelihood
human
health
disaster
climateservices
cross-sectoral
wateruseefficiency
resilientpower
energyreliability
wateruseefficiency
livestock
forest
fisheries
cropland
costalzone
coastal
biodiversity
agroforestry
land ocean ecosystems
watermanagement
sustainableplanning
greeninfra
CCI
MXI
VOI
0.0 0.2 0.4 0.6 0.8
1960 1980 2000 2020
Riskspreading
Climateservices
wateruseefficiency
Sustainableplanning
TF-IDF Value
YEAR
2020
2000
1980
1960

Figure S2. Comparative analysis of three datasets over time

Comparative Analysis of Three Datasets Over Time. This graph contrasts the estimated Policy Stringency on Climate Change (PSCC) and Environmental Policy stringency (EPS) from Zhang et al. (2022) and OECD (2016). Three parallel time series are depicted. Within each time series, EPS is denoted by dashed lines, while PSCC is indicated by solid lines, and OECD EPS is represented by dot-dash line. Abbreviations on the timeline mark significant global and national climate milestones: 1) IPCC: Establishment of the Intergovernmental Panel on Climate Change; 2) AR1 & NCCG: IPCC's first assessment report & Establishment of the National Climate Change Coordination Group in China; 3) UNFCCC signed: The United Nations Framework Convention on Climate Change was signed by 154 states; 4) UNFCCC enters in force: United Nations Framework Convention on Climate Change entered into force; 5) COP1: First Conference of the Parties; 6) 9th FYP: Ninth Five-Year Plan incorporating energy and emissions goals in China; 7) Kyoto Protocol: Adoption of the Kyoto Protocol at COP3; 8) COP7 & AR3: Marrakesh Accords and third assessment report; 9) CA1: First comprehensive assessment of climate issues in China; 10) Bali Road Map & AR4: Fourth assessment report and Bali Road Map at COP13; 11) CCD: Establishment of the Climate Change Department in NDRC of China; 12) CA2: Second National Climate Change Assessment Report; 13) NCCR Plan: The National Climate Change Response Plan (2014–2020) released in China; 12) Paris Agreement: Adoption at COP21; 14) 13th FYP: Five-Year Plan with a dedicated chapter on climate change in China; 15) 2060: China's Goals for carbon peak and neutrality set for 2030 and 2060; 16) 14th FYP: Two milestone Policies related to '2060' targets released in China; 17) NSCCA 2035: National Strategy for Climate Change Adaptation 2035 in China.

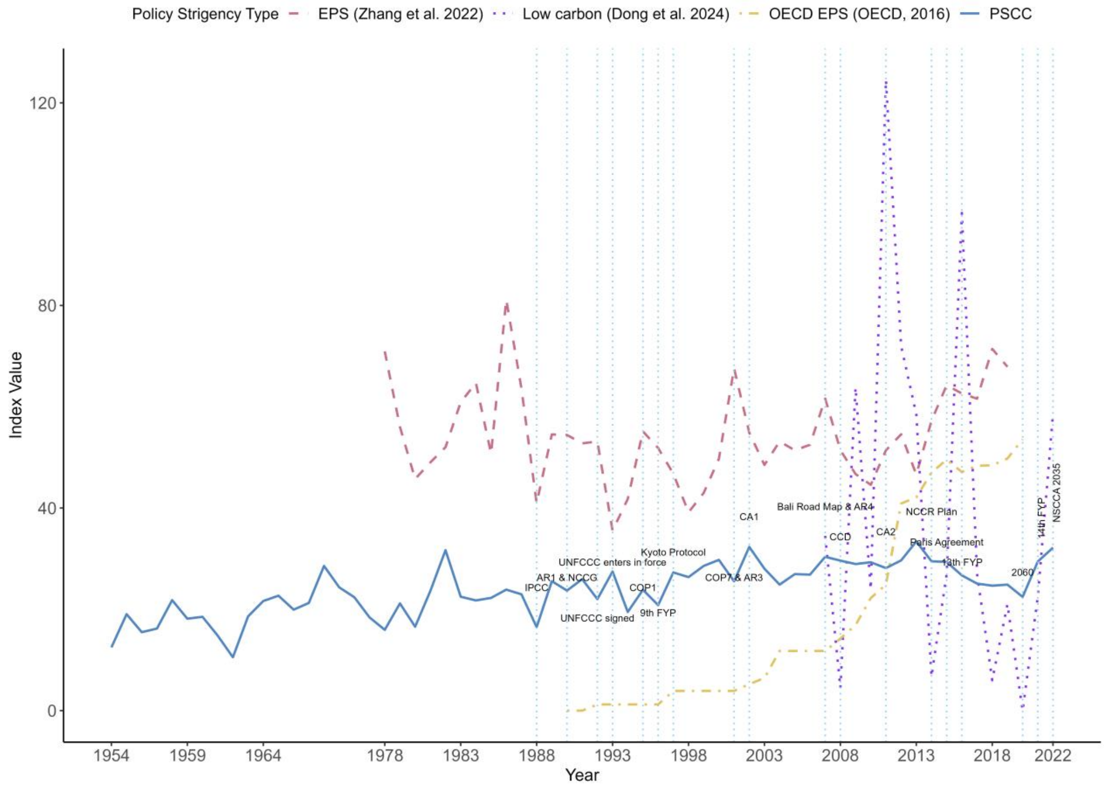

Policy Strigency Type
EPS (Zhang et al. 2022)
Low carbon (Dong et al. 2024)
OECD EPS (OECD, 2016)
PSCC
Index Value
120
80
40
0
Year
1954
1959
1964
1978
1983
1988
1993
1998
2003
2008
2013
2018
2022
IPCC
AR1 & NCCG
UNFCCC enters in force
UNFCCC signed
COP1
9th FYP
Kyoto Protocol
COP7 & AR3
CA1
Bali Road Map & AR4
CCD
CA2
NCCR Plan
Paris Agreement
13th FYP
2060
14th FYP
NSCCA 2035

Figure S3. Comparative analysis of two datasets over time based on same policy.

This graph contrasts the estimated Policy Stringency on Climate Change (PSCC) and Environmental Policy stringency (EPS) of the same policy in two datasets over time. Two parallel time series are depicted. Within each time series, EPS is denoted by dashed lines, while PSCC is indicated by solid lines. Acknowledging the similar methodologies employed in dataset, we utilized the 'fuzzyjoin' package developed by in R 4.3.2 to identify the same policies in both datasets for a deeper examination of the discrepancies between PSCC and EPS in the same policy. These findings are visualized in following figure. From this figure, a distinct divergence around the year 2000 becomes apparent. Before 2000, the discrepancy between PSCC and EPS was small in the same policy, but post-2000, we observed a clear bifurcation, indicating the formal separation of climate and environmental policies in China. And this discovery further explained the divergent we found in Figure C.7.

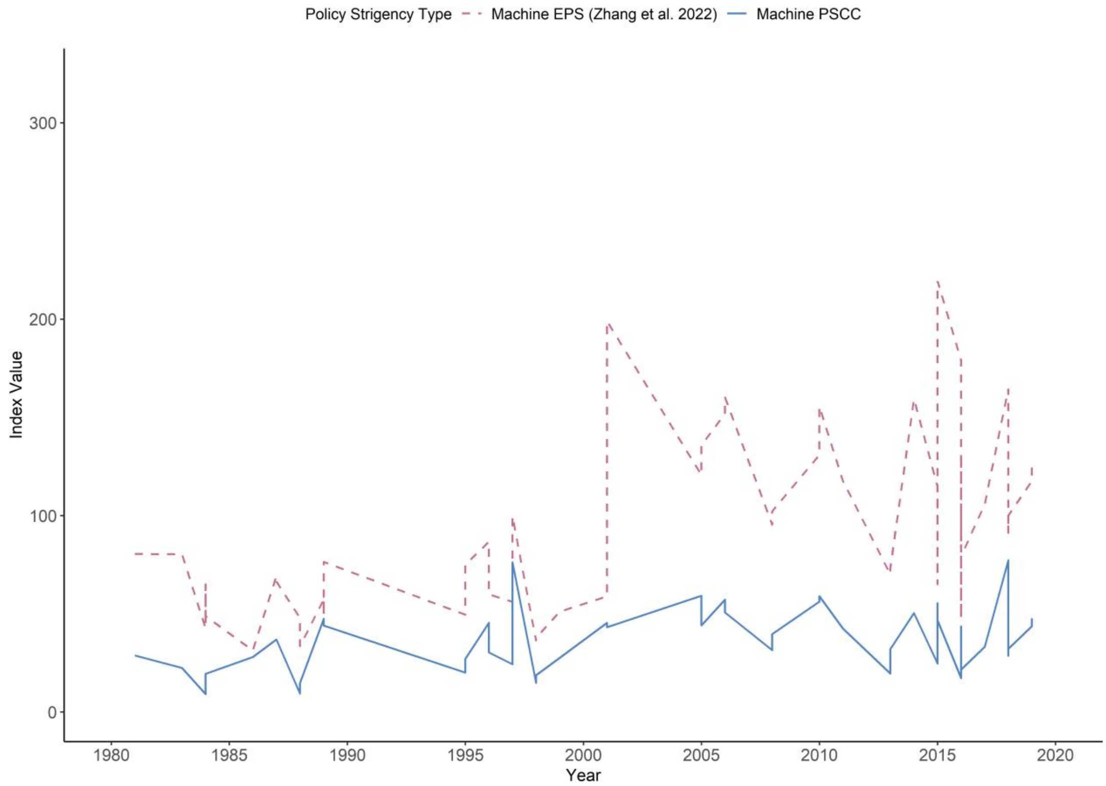
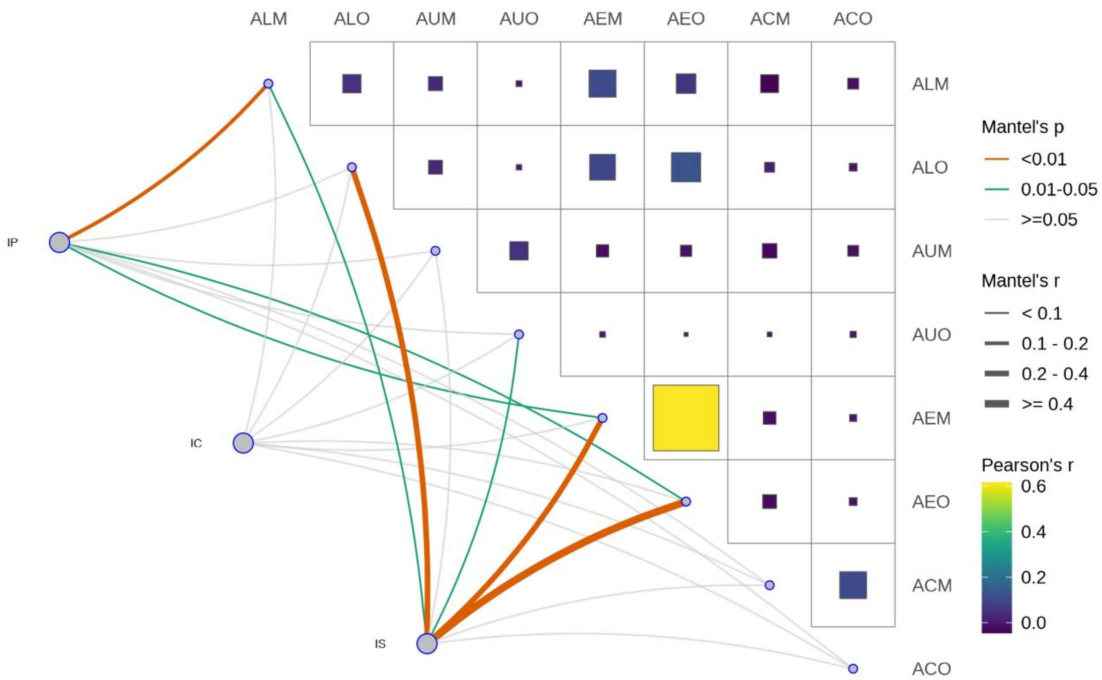
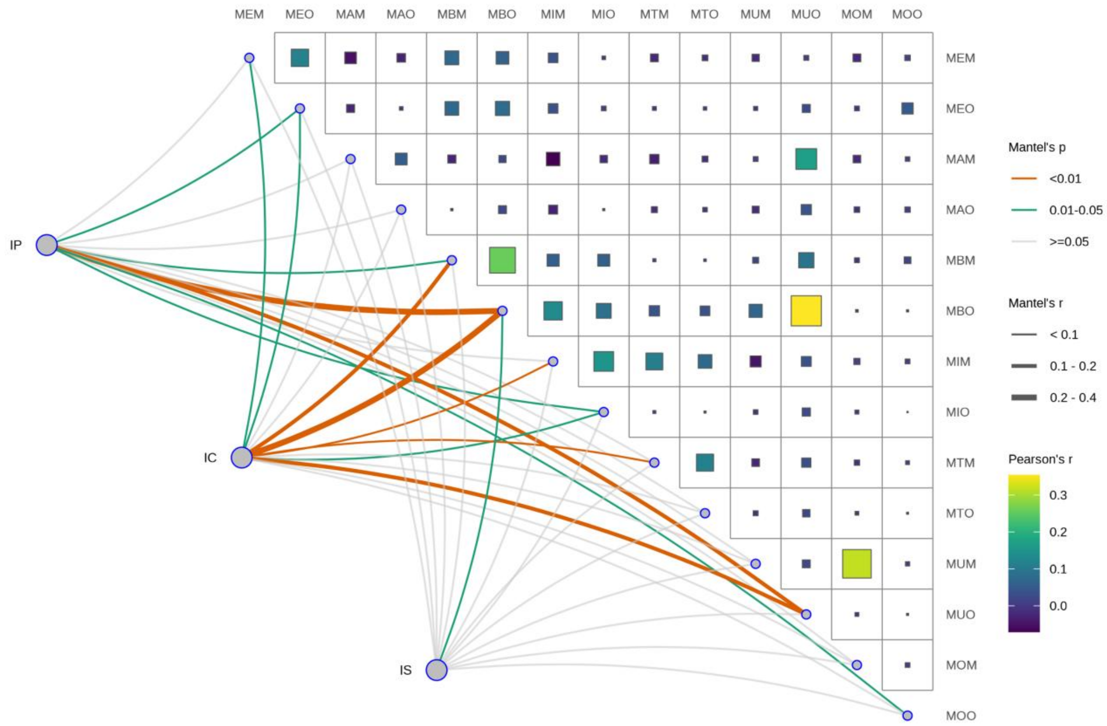


Figure S4. The mantel test for matrices among mitigation, adaption, and implementation.

The Mantel Test for Matrices among Mitigation, Adaption, and Implementation. The correlation between Mitigation-Implementation and Adaption-Implementation are tested, where the upper part depicts the correlation plot within sub-dimensions of mitigation and adaption themselves with yellow rectangular denoting high Pearson's r and dark blue rectangular denoting low Pearson's r, the lower part depicts the correlation plot between the sub-dimensions of mitigation/adaption and implementation, where orange line denoting Mantel's p < 0.01, green line denoting Mantel's p is between 0.01-0.05, and grey line denoting Mantel's p ≥ 0.05. The thick line in the lower part denotes Mantel's r < 0.1, the fine line denotes Mantel's r is between 0.2-0.4.



(a) Mantel test for Mitigation-Implementation



(b) Mantel test for Adaption-Implementation

Note S1: The definition of evaluation metrics in LLM-based filtering and classifying system

To assess the performance of our large language model (LLM) classification system, we employ four standard evaluation metrics: accuracy, precision, recall, and F1-score. These metrics offer a comprehensive understanding of the model's performance in classifying policies and policy instruments. Below, we define each metric and provide the corresponding formulas. We used the metrics in sklearn python package. Before explaining the method of calculation, it's important to note that there are several different averaging methods: 1) Binary-average is used in binary classification tasks, where the performance is calculated for each class separately, typically focusing on the positive class. 2) Weighted-average considers the relative size of each class and computes the average accordingly, making it more suitable for imbalanced datasets. This method ensures that larger classes have a greater influence on the final metric. 3) Micro-average aggregates the contributions of all classes to compute the average metric, treating each instance equally, regardless of class size. 4) Macro-average computes the metric independently for each class and then averages the results, treating all classes equally, regardless of their size, making it useful in datasets where the performance across classes is equally important. We choose the binary average method for our policy filtering task and weighted average method for our policy instrument classification task.

The calculation of our evaluation metrics is following:

1. Binary Average evaluation metrics Calculation (for policy filtering task)

For binary classification, the metrics (precision, recall, and F1-score) are typically calculated for the positive class, assuming a "one-vs-rest" approach. Here's how each metric is computed directly for the positive class:

Accuracy

Definition: Accuracy measures the overall correctness of the model by calculating the ratio of correctly classified instances (both true positives and true negatives) to the total number of instances.

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{TN} + \text{FP} + \text{FN}}$$

Where:

- TP = True Positives (correctly predicted positive instances)
- TN = True Negatives (correctly predicted negative instances)
- FP = False Positives (incorrectly predicted as positive)

- FN = False Negatives (incorrectly predicted as negative)

Precision

Definition: Precision (also known as the positive predictive value) measures the proportion of true positives among all instances that were predicted as positive. It indicates how many of the predicted positive results are actually correct.

$$\text{Accuracy} = \frac{\text{TP}}{\text{TP} + \text{FP}}$$

A higher precision means fewer false positives, which is particularly important in scenarios where false alarms (incorrect positive classifications) must be minimized.

Recall

Definition: Recall (also known as sensitivity or true positive rate) measures the proportion of true positives that were correctly identified by the model. It indicates how many of the actual positive instances were successfully classified as positive.

$$\text{Recall} = \frac{\text{TP}}{\text{TP} + \text{FN}}$$

A higher recall indicates fewer false negatives, which is crucial in cases where missing positive instances (false negatives) could lead to significant issues.

F1-Score

Definition: The F1-score is the harmonic mean of precision and recall. It provides a single measure that balances both concerns, making it particularly useful when there is an uneven class distribution or when precision and recall are equally important.

$$\text{F1} - \text{Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$

The F1-score combines both precision and recall into a single metric, providing a comprehensive view of the model's performance. A high F1-score indicates that both precision and recall are balanced.

2. Weighted-Average Calculation (for policy instrument classification task)

In multi-class scenarios with imbalanced classes, we use a weighted average to give more importance to classes with more instances.

Let k be the index of each class, N_k the number of true instances in class k, and K the total number of classes. Then, the weighted average is calculated as follows:

Weighted Precision

$$Precision_{weighted} = \frac{\sum_{k=1}^{K} N_k \times Precision_k}{\sum_{k=1}^{K} N_k}$$

Weighted Recall

$$Recall_{weighted} = \frac{\sum_{k=1}^{K} N_k \times Recall_k}{\sum_{k=1}^{K} N_k}$$

Weighted F1-Score

$$F1_{weighted} = \frac{\sum_{k=1}^{K} N_k \times F1_k}{\sum_{k=1}^{K} N_k}$$

Where $Precision_{weighted}$, $Recall_{weighted}$, $F1_{weighted}$ are the precision, recall, and F1-score for class k, respectively. N_k represents the number of instances in class k, which means that larger classes contribute proportionally more to the overall metric in a weighted-average calculation. This approach ensures that classes with more instances have a greater influence on the final score, making it especially useful in datasets with imbalanced classes.

Note S2: Principal component analysis (PCA) for spatial difference calculation

Principal Component Analysis (PCA) is a statistical technique used for reducing the dimensionality of data while retaining as much variability as possible (Jolliffe, 1986; Matteson and Tsay, 2017). Widely applied in multivariate data analysis, PCA simplifies complex datasets by transforming them into a set of linearly uncorrelated variables called principal components. These components capture the data's most significant patterns by maximizing variance across the transformed dimensions, making it a powerful tool in climate and environmental studies where multidimensional data is common.

This method has been effectively applied in various studies to analyze climate change indicators, assess environmental vulnerabilities, and evaluate policy impacts. For instance, Tadić et al. (2019) employed PCA to assess climate change by analyzing multiple meteorological parameters, enabling a comprehensive understanding of climate variability. Similarly, Feng et al. (2023) utilized PCA to develop blue carbon development index (BCDI), identifying key factors contributing to BCDI. Additionally, Cai et al. (2023) applied PCA to analyze climate change in the Yangtze River Basin, highlighting significant trends and patterns in regional climate data.

In our analysis, PCA is used to calculate the spatial scale factor SD_{in} by analyzing text data from policy documents across four spatial categories: universal, regional, provincial, and prefecture. These categories are transformed into TF-IDF (Term Frequency-Inverse Document Frequency) values to capture the importance of spatial references within policy text, aiding in the differentiation of local and broad-scale policy impacts. The usage of key word can be found in the lexicon under Tier I-Spatial Difference sheet.

Our PCA process involves the following steps:

1. **Data Standardization:** Each spatial indicator is standardized to ensure comparability by centering it on a mean of zero and scaling to a standard deviation of one. Let x_{ij} represents TF-IDF score of spatial category j in policy i. The standardized value z_{ij} is computed as:

$$z_{ij} = \frac{x_{ij} - \overline{x}_j}{s_j}$$

where $\overline{x}_j$ is the mean and s_j is the standard deviation of the TF-IDF scores for spatial category j.

2. **Covariance Matrix Computation**: We construct a covariance matrix C to identify relationships between the standardized spatial indicators. This matrix helps reveal variations in spatial emphasis within policies:

$$C = \frac{1}{n - 1}\sum_{i=1}^{n} Z_i Z_i^T$$

where Z_i is the vector of standardized values for policy i, and n is the number of policies.

3. **Eigenvalues and Eigenvectors Calculation**: The eigenvalues λ_k and corresponding eigenvectors e_k of the covariance matrix C are calculated. Each eigenvector represents a principal component, which is a weighted combination of the original spatial indicators. The principal components are ordered by the amount of variance they explain, as determined by their eigenvalues:

$$Ce_k = \lambda_k e_k$$

where λ_k is the eigenvalue for the k-th principal component.

4. **Selection of Principal Components**: The principal components with the most variance is selected to explain spatial scale. We select the first three-dimension, which components that explain 81% of the variance in spatial data are retained to calculate the spatial scale factor, balancing comprehensiveness with dimensional simplicity.

5. **Spatial Scale Factor (SD_{in}) Calculation**: The retained components are used to adjust the stringency score, ensuring policies with broader spatial impacts are weighted differently from those with localized impacts. This PCA-derived spatial factor $\boldsymbol{SD_{in}}$ adjusts the manual policy ratings, making the PSCC score responsive to geographic variability and ensuring comprehensive spatial representation:

$$SD_{in} = \sum_{k=1}^{3} PC_{ik}$$

where PC_{ik} represents the k-th principal component score for policy i.

This PCA-derived spatial factor SD_{in} is integrated into the Policy Stringency on Climate Change (PSCC) calculation to enhance the geographic sensitivity of the score, thereby ensuring a comprehensive spatial representation of policy impacts.

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