



**KAUTILYA**

**SCHOOL OF  
PUBLIC POLICY**

Issue

**Brief**

Series



## **“The Water-Energy-Food Nexus in India and China”**

Issue Brief: IB-2026-51

Submitted by: Simran Kaur (MPP Cohort 2024-26)

Under the Supervision of: Dr. Amrendra Pandey, Assistant Dean of Research, Kautilya School of Public Policy

Cite this report as: Kaur, S. (2026) “The Water-Energy-Food Nexus in India and China” [online].

Available at: <https://www.kspp.edu.in/issue-brief/the-water-energy-food-nexus-in-india-and-china>

## **Table Of Contents**

[List Of Figures & Tables](#)

[Abstract](#)

[Introduction](#)

[Policy Coordination: Concepts and Politics](#)

[The WEF Nexus in India and China](#)

[Using Process Tracing as a Method](#)

[Analysis](#)

[Incentive Misalignment](#)

[Rival Hypothesis](#)

[Evidentiary Tests](#)

[Crisis-Induced Coordination](#)

[Rival Hypothesis](#)

[Evidentiary Tests](#)

[Central Enforcement](#)

[Rival Hypothesis](#)

[Evidentiary Tests](#)

[Path Dependency](#)

[Rival Hypothesis](#)

[Evidentiary Tests](#)

[Discussion](#)

[Recommendations For India's WEF Nexus](#)

[Limitations](#)

[Conclusion](#)

[References](#)

**List Of Figures & Tables**

Figure 1 Illustration of WEF nexus.....	6
Table 1 Evidentiary tests results.....	10
Figure 2 Policy reform framework for WEF coordination.....	21
Figure 3 Policy cycle in WEF nexus.....	22

## The Water-Energy-Food Nexus in India and China

### Abstract

Much of the existing literature on policy coordination in the water–energy–food (WEF) nexus falls short of unpacking the institutional factors that enable or constrain nexus outcomes. This study employs process tracing to examine the historical trajectories of WEF governance in India and China. While China under Xi Jinping has institutionalized coordination under the banner of *ecological civilization*, India has struggled to establish cross-sectoral synergies necessary for WEF security. The analysis investigates how political incentives and institutional mechanisms shape coordination outcomes in these two contexts. By comparing divergent administrative logics and political economies of coordination, the study highlights why similar resource challenges have produced different governance outcomes. In doing so, it shifts attention from the technical modeling of the WEF nexus to the political conditions that continuously structure its possibilities, thereby contributing to broader debates on nexus governance.

*Keywords: policy coordination, integration, WEF nexus, political economy, cross-sectoral interlinkages*

### Introduction

#### *Policy Coordination: Concepts and Politics*

The literature on policy coordination has been expanding, not least due to the growing complexities of contemporary policy regimes (Bolognesi et al., 2021). As the world’s largest democracy, India faces complex administrative and socio-economic challenges in addressing the diverse needs of its citizens. These challenges demand a seamless integration of policy options to tackle the various wicked problems that plague the country (Trein et al., 2021). Yet parliamentary bypasses often undermine participatory processes, with limited inter-ministerial input into ostensibly cross-sectoral policies (Jain,

2022). This undermines opportunities for policy learning and inter-departmental alignment (Lele et al., 2013).

Policy coordination may be horizontal (inter-departmental or cross-sectoral alignment of objectives, processes, or outcomes) or vertical (federal convergence between the centre and the states) or both, underscoring the varied nature of research on the topic. Beyond this distinction, coordination can also be negative, where programs reduce conflicts with one another, or positive, where departments actively cooperate to serve diverse citizen groups, or strategic, where program objectives are explicitly aligned with broader national goals. Strategic coordination is especially critical in cross-cutting domains such as sustainability and climate change (Peters, 1998, 2018).

The verdict on the significance of coordination in improving policy outcomes remains inconclusive (Bakvis & Brown, 2010). National governments have attempted either to remove redundant policies, thereby reducing the ‘extent’ or number of schemes within a jurisdiction, or to establish synergies between them to avoid duplication. Yet in India, policy coordination has not received adequate attention. In contrast, China has institutionalised coordination mechanisms under the banner of “ecological civilisation” through central orders (Jiang et al., 2019), yet local implementation gaps persist, for instance in air pollution controls and water management. These contexts therefore offer fertile ground to investigate how political incentives, crises, and institutional arrangements interact to shape coordination outcomes.

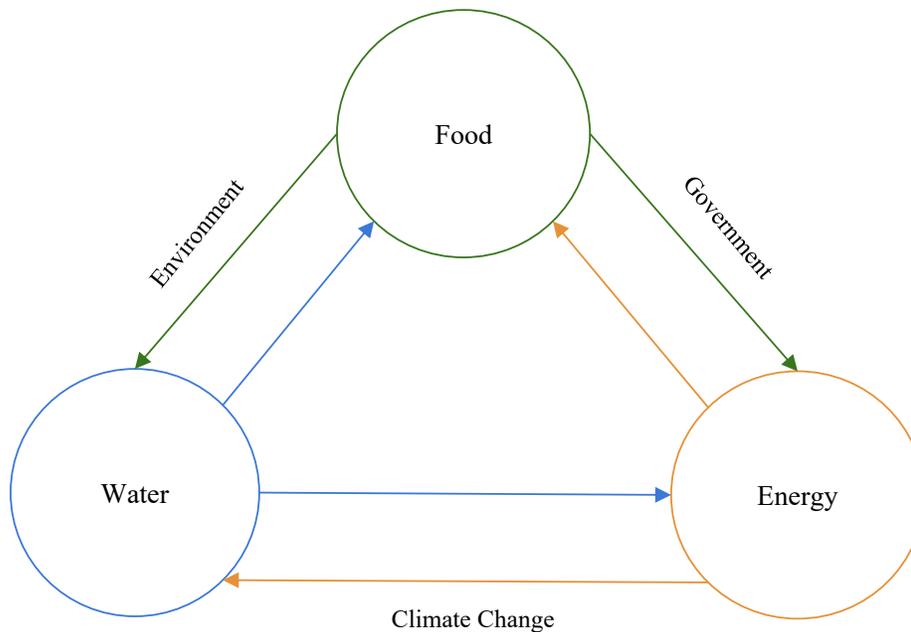
### ***The WEF Nexus in India and China***

The concept of the water-energy-food (WEF) nexus has gained traction in recent years to account for the increasing interdependencies of these systems in achieving security in each domain (Lele et al., 2013; Rasul & Neupane, 2021). More recent studies have attempted to unpack the trade-offs and rivalries

between resources from a technical perspective. For instance, how water-use subsidies shape food production and energy intensity (Gu et al., 2014; Jin et al., 2022; Kou et al., 2025; Qin et al., 2025). System dynamics modeling of the WEF nexus has aimed to capture these interdependencies and feedback effects (Zahedi et al., 2024). Much of this literature focuses on South Asia, where large populations depend on agriculture for their livelihoods (Bhagirath, 2025), though such work often does not translate into a clear understanding of what constitutes effective policy coordination mechanisms in the region.

Figure 1

*Illustration of WEF nexus*



*Note.* Adapted from Bian & Liu (2021).

Since independence, national priorities in India have largely emphasized food sovereignty and self-sufficiency as a safeguard against food crises and reliance on imports (Mooij, 1998). The Green Revolution of the 1960s made India food-secure, but its lasting impacts on groundwater depletion and energy lock-ins continue to be felt, as a large population in the country still faces acute water stress (A Parched Nation, 2024). China, on the other hand, has achieved better water use efficiency with relatively lower agricultural share over time, despite similar endowments as India in terms of poverty and

agricultural productivity (Lele et al., 2013). Scholars attribute China's success in agricultural policy to the persistence of a command-and-control regime, even as decentralization takes root, while they attribute India's difficulties to having dismantled colonial command-and-control structures without adequately modernizing sectoral operations (Lele et al., 2013).

Importantly, there is broad agreement that governance factors including fragmented ministerial mandates, weak inter-ministerial forums, and electoral incentives remain underexplored despite their importance in either inhibiting or enabling coordination. The call by Rasul and Neupane (2021) for empowered cross-sectoral bodies points to one potential pathway, but the political economy of coordination ultimately determines whether such bodies function in practice.

### **Using Process Tracing as a Method**

In recognition of the literature gaps and the strength of qualitative approaches, this study employs process tracing (PT) to unravel the historical evolution of India's and China's sectoral policies in the WEF nexus. PT is a method grounded in the temporal and spatial analysis of historical events, tracing X (independent variable) to Y (dependent variable) through intervening variables or causal mechanisms in a chain of events (Beach, 2016; Collier, 2011; Kay & Baker, 2015; Ricks & Liu, 2018; Trampusch & Palier, 2016). While the scope of PT research continues to grow, scholars generally agree that it addresses the limitations of quantitative statistical methods, which establish correlations but often obscure causal pathways (Collier, 2011).

Initially applied in international relations, PT has expanded into comparative political economy, where it is used to explain decision-making processes by identifying the stimuli behind political choices and behaviours (Trampusch & Palier, 2016). Although describing the different types of PT lies beyond

the scope of this study, it is worth noting that PT can be deductive or inductive, making it a suitable approach for theory development *and* testing in case studies.

This study applies PT to examine how political agendas and incentives shaped policy coordination (or its absence) in the WEF nexus of India and China. In both contexts, political willingness is previous to political agendas (Manazir, 2025), as different actors have endorsed policies aligned with their interests. By tracing historical narratives since independence, this study aims to identify the causal mechanisms that have either inhibited or encouraged coordinated government action in addressing WEF insecurities.

The following hypotheses were formulated to address specific political economy factors, namely:

**H1:** If policy actors seek to maximize their incentives, then horizontal coordination across WEF departments will remain weak.

**H2:** If major crises occur, they create temporary windows of opportunity for cross-sectoral coordination; however, unless institutionalised, such coordination quickly fades.

**H3:** Coordination is sustainable only when a central authority mandates joint targets, possesses enforcement capacity, and monitors compliance.

**H4:** Early policy choices create path dependencies that develop sectoral silos, limiting later efforts at integration.

In the following section, I analyse and test these hypotheses against four tests (straw-in-the-wind, hoop, smoke-gun, doubly decisive) using evidence from various sources including government reports, secondary evidence, media archives, wherever accessible. Following that, I outline the historical WEF trajectories for both countries, concluding with assessing the comparative strength of all hypotheses.

## Analysis

### *Incentive Misalignment*

In both India and China, entrenched incentives have shaped bureaucratic behaviours since their independence (Lapicciarella, 2015). Derived from colonial era bureaucratic legacies, the Indian pluralistic system often provokes ministries to enhance their sectoral portfolios by protecting their budgets and career-track programs, at the expense of cross-cutting governance [citation]. The legacy of “inspector raj” in India, a regulatory system rooted in the British-era civil service, still carries the connotation of corruption, bribery and rent-seeking that plagues Indian society even today (Misra, n.d.). This underscores how institutional norms bias have lingered, where officials prioritize enforcement over collaboration, creating a culture of rent-seeking (Krueger, 1974). As a result of this, inter-ministerial coordination has been limited. According to a 2024 study, 43% of infrastructure projects were embroiled in inter-ministerial disagreements (Ahuja, 2025). Water resources and Environment ministries have clashed over environmental impact assessments of the Ken-Betwa river linking project (The Times of India, 2025). Although the scope for inter-ministerial deliberations is increasing due to the existence of sheer abundance of problems including climate crisis, India’s parliament frequently bypass democratic processes to pass siloed bills.

By contrast, China’s authoritarian political economy creates different dynamics. Under Mao, a unified command system initially aligned water, energy, and agriculture goals, but Deng-era reforms introduced market pressures and decentralized fiscal incentives that fragmented decision-making. Since the 1980s, the Chinese model has been represented in literature as “fragmented authoritarianism” (FA) wherein the local actors and mid-level bureaucracies bargain with the higher authorities over their mutually exclusive interests and priorities (Taylor & Garlick, 2025). China’s wind-energy development is a case in point. The period between 1986 and 1999 harnessed low wind output despite installed turbines on account of conflicting and disjointed policy initiatives by energy authorities. This trajectory was

corrected during the coordinated phase of 2000-2006 when coordinated market regulations and incentives led to increased uptake and performance (Lema & Ruby, 2006). The institutional failure had laid out the lesson for China in terms of strong central coordination, via mandatory renewable energy quotas and energy targets, in solving the mismatch between capacity and output.

**Rival Hypothesis.** A possible rival to this hypothesis can be that weak coordination is mainly driven by institutional structure rather than incentives per se. For example, one could argue that India's federalism prevents ministries from enforcing mandates, or that different ideologies guide different departments which inherently limit cooperation. If this view were true, then aligning budgets alone would not foster integration, since the very nature of federalism would be to blame.

**Evidentiary Tests.** H1 passes the straw-in-the-wind test where although the evidence is non-conclusive, the hypothesis might be true. It also passes the hoop test; there is no instance of strong horizontal integration in the WEF nexus despite misaligned incentives. Similarly, in China, coordination only improved once the skewed incentives were aligned via quotas. For the smoking-gun test, China's wind sector provides the strongest case as mentioned earlier. However, in India, there is no comparable case because incentives have largely remained siloed. As for the doubly decisive test, there is no single piece of evidence that is sufficient and necessary to rule out the alternative hypothesis. That is to say, interparty politics can also explain the absence of policy coordination in the WEF nexus. The table below summarises the test results against each hypothesis.

Table 1

*Evidentiary test results*

Hypothesis	Straw-in-the-Wind	Hoop	Smoking Gun	Doubly Decisive
------------	-------------------	------	-------------	-----------------

H1: Misaligned incentives weaken coordination	Passed (ministers prioritize sectoral budgets)	Passed (no example of coordination despite misaligned incentives)	Passed (China's renewables quotas tied to outcomes)	<i>Failed</i>
H2: Crises create temporary coordination	Passed (joint task forces formed in crises)	Passed (coordination found only with crisis, not otherwise)	Failed (no evidence of long-term integrated reform)	<i>Failed</i>
H3: Central mandate enables lasting coordination	Passed (India's lack vs China's enforcement create different outcomes)	Passed (no lasting coordination without formalisation)	Passed (China's constitutional mandates and new ministries)	<i>Failed</i>
H4: Path dependency from early choices constrains integration	Passed (colonial legacy created siloed ministries)	Failed (China partly overcame legacy; not strictly necessary)	Passed (clear lineage from colonial policies to current silos)	<i>Failed</i>

---

*Note.* Straw-in-the-wind, hoop, smoking-gun, and doubly decisive tests are evidentiary tools that assess the strength of a causal hypothesis. Straw-in-the-wind provides weak support that suggests that the hypothesis may be true. The hoop test offers a necessary condition, without which the hypothesis is ruled out. The smoking-gun test provides a sufficient condition but does not eliminate other hypotheses. A

doubly decisive test provides necessary and sufficient evidence, confirming the hypothesis and ruling out the rivals.

### ***Crisis-Induced Coordination***

Major crises had led both India and China to spring into joint action, however, these gains had been short-lived. In India, drought situation and energy crunches have prompted arbitrary coordination in the early 2010s, when the central government convened inter-ministerial task forces and relief committees that linked water allocations with energy provision. Similarly, food and water shortages have propelled central-state working groups on irrigation and food procurement. This coordination falters once immediate crisis eases off, and entrenched incentives reassert themselves unless new rules are enforced.

In China, severe floods or blackouts galvanised the State Council to issue emergency directives. For example, the Yangtze flood of the late 1990s and the nationwide power shortages of 2004 both led Beijing to assemble high-level committees and required multiple departments to work together on relief and reconstruction (Sim & Yu, 2018). In principle, China's top-down governance should convert these moments into lasting integration. In practice, however, such initiatives often got hampered due to the absence of formalization in law or plans.

**Rival Hypothesis.** An alternative is that crises might actually lead to permanent change, and not just temporary fixes. If this were to be true, coordination would persist even after the crisis subsides. Another rival is that coordination might have happened for other reasons like regular bureaucratic reform plans, and crises coincided with it.

**Evidentiary Tests.** H2 passes the straw-in-the-wind test since in multiple incidences of crisis, both countries have initiated joint action, but this could easily be coincidental. Therefore, this is weak support. H1 also passes the hoop test; if we saw substantial coordination in the absence of any crisis, H2 would be undermined. Since this has not been the case, the necessary condition holds. A smoking gun here would be a case where a crisis directly led to lasting policy coordination. Both countries' experiences suggest that this did not occur. India's task forces post the 2012 drought were disbanded within months, and China's post-flood committees also suffered the same fate. Thus, H2 fails the smoking-gun test. Similarly, H2 does not pass the doubly decisive test since no evidence rules out rival hypotheses and confirms H2.

### ***Central Enforcement***

Both India and China diverge sharply with respect to administrative processes where China's unitary state has the mandate to impose joint targets and where India's federal system does not have the structural or constitutional mandate to force sub-governments into strict enforcement. In India, there is no single authority empowered to warrant integrated action in the WEF nexus. Ministries issue guidelines and states formulated their own plans, taking their context in consideration. This causes inter-regional variations in policy implementation without binding targets and enforcement, and each sector monitors their own output for meeting their sectoral objectives. No pan-departmental enforcement mechanisms oversee compliance which impedes alignment across departments.

By contrast, China's central command can and has enforced cross-sectoral goals under Xi's ecological civilization agenda by setting binding quotas and performance metrics that cut across ministries (Hansen et al., 2018). Central plans and laws now often combine water and energy objectives, with directives for state agencies to meet national water-conservation and energy-intensity targets collectively, failing which could warrant bureaucratic sanction. China has also established ecological conservation redlines and created leading bodies such as the Ministry of Ecology and Environment and the Ministry of Natural Resources to oversee implementation and compliance (Gao et al., 2020). This instance exemplifies policy coordination to align with the objective of ecological conservation. Such a centralized mandate is effective because China's Party acts as the authority to assign clear joint targets and monitor cadres for compliance. In light of this discussion, H3 is supported in the case of China, but not in the case of a weak state like India where enforcement costs impede horizontal (and vertical) coordination.

**Rival Hypothesis.** An alternative view is that coordination can happen without top-down enforcement, where voluntary coalitions might sustain cross-sector action. A strong center may not be strictly necessary if Indian states pursued their coordinated paths through their own initiatives or if technology can intervene to create (favourable) conditions for policy coordination.

**Evidentiary Tests.** H3 is only weakly supported; while a lack of central enforcement can explain why coordination does not happen in India when it does in China, there have been instances where Indian state governments have attempted to integrate water-energy projects voluntarily (e.g. with metered electricity or interlinking river basins with hydro plants). This suggests that coordination can occur without a central mandate. H3 passes the hoop test, since it satisfies the necessary condition that coordination cannot be sustained without a central enforcer. As for the smoking-gun test, H3 is supported in the case of China but not India. Both countries' cases fail to pass the doubly decisive test; the Chinese constitutional amendment is powerful, but China also has other governance differences from India, so this cannot alone rule out all rivals.

### ***Path Dependency***

In India, colonial and early-postcolonial arrangements still persist to some extent and shape today's barriers. The Company, during its rule in India, established separate authorities for irrigation, power and agriculture. From 1855, PWD officers oversaw "Irrigation & power" but by 1919, irrigation became a provincial domain. Post-independence reorganizations still split these functions by creating a dedicated Ministry of Irrigation and Power in 1952. Emerged then in response to demanding circumstances, the Green Revolution of the 1960s embedded input subsidies for groundwater and energy use – in the form of irrigation pumps – to increase food production in agricultural policies; any reform to this governmental support has provoked several farmer states to protest (Badiani-Magnusson & Jessoe, 2018). These early choices have led to path dependencies where, despite the acute water stress and low

soil productivity, the government is obliged to work with subsidies as a constraint rather than against them in any subsequent related policy, making integration difficult (Zafar et al., 2023).

China's leadership, however, provides a different script for reforms. After a period of highly centralized state bureaucracy under Mao, later reforms instituted decentralization in the country which prompted local governments to pursue their own growth agendas, inhibiting coordination. Even so, the previous investments of the 1990s in massive state-led projects like the South-North Water Transfer and power stations still shape resource allocation today (Zhou et al., 2024). What sets China apart from India is the lingering "command-and-control" mindset that has worked in the favour of Chinese agriculture, which does not preclude replacing old paths with new ones if the Party leadership so wishes. Therefore, H4 is supported in case of India, but only partially for China, where the weight of legacy and the possibility of reorientation co-exist to breed conditions for policy coordination.

**Rival Hypothesis.** A rival is that current political factors may matter more than historical legacy. This position argues that if political will were sufficient, India's colonial choices would not prevent coordination through better leadership or initiatives.

**Evidentiary Tests.** H4 passes the straw-in-the-wind test, since the past choices still determine the course of policy action (e.g. agricultural policies). H4 fails the hoop test for the Chinese example, since we can find counterexamples where it has been possible to break away from the past (ecological laws in case of China) by introducing new agendas. Thus, H4 is not strictly necessary everywhere, although it explains the current siloes in India. H4 fails the doubly decisive test since there is no evidence that the rival hypotheses could not be true.

## Discussion

Since their independence, India (1947) and China (1949) have chartered different development pathways emanating from their specific historical context and leadership visions. China's one party state pursued large infrastructure projects and market reforms under leaders like Mao Zedong, Deng Xiaoping and Xi Jinping, while democratic India adopted a more incremental mixed economy model under the leadership of Jawaharlal Nehru and Indira Gandhi. This had an effect on how water, energy, and food systems evolved, and how nexus policies have (or have not) been coordinated. By examining the political economy around the nexus including leadership personalities, we can see how India and China diverged in the WEF nexus.

Post-independence, Nehru and Mao outlined grand development plans. In India, Nehru viewed large dams and steel plants as the “temples of modern India” (The Hindu, 2015). Major irrigation projects to boost agriculture and hydropower, eg. Bhakra-Nangal Dam and Indira Gandhi Canal, were an outcome of this vision. His socialism fostered state-owned enterprises and scientific institutes, with heavy-industry infrastructure that consumed large water and energy input. On the other hand, Mao gave impetus to mass mobilization and small-scale irrigation in the 1950s, famously noting during a 1952 visit to the Yangtze region “[t]he South has plenty of water and the North lacks it, so if possible, why not borrow some?” (Freeman, 2011). This inspired Mao's long-term vision of massive projects, e.g. tube wells in northern China and later, the South-North Water Transfer Project. However, Mao's Great Leap Forward of the late 1950s forcibly collectivized agriculture, which resulted in a famine in the country, leading China to make moves towards ensuring food security (Li & Yang, 2005).

India's Green revolution led to increased cereal production by introducing high-yield seeds, fertilizers and irrigation to Punjab and Haryana (Singh, 2000). Although these dwarf wheat varieties effectively doubled the yields in India's breadbasket, these miracle crops consumed large inputs of water and energy. In fact, by the 1970s. India was heavily subsidizing electricity for groundwater irrigation.

There were consequences to this strategy where unchecked pumping led to rapid groundwater depletion in the north and fertilizer run-off polluted soils and rivers. The government's procurement policies guaranteed minimum prices for wheat and rice, encouraging overproduction in already-irrigated regions. Therefore, food security was achieved at the cost of water and energy sustainability [citation].

China's agricultural transformation followed a very different path. In 1978 Deng's reforms dismantled Great Leap Forward era collectivisation to allow household contract farming, called the "responsibility system", which immediately boosted food production (FAO, 2006). From 1980 onward, rural incomes and yields jumped under a market-oriented system. Unlike India's initial Green Revolution push, China's priority was stabilizing grain production, and only later did China invest heavily on R&D and productivity. China has achieved 100% self-sufficiency in cereals with far smaller per-capita farmland than India. The Chinese constitution explicitly declared water, land and natural resources as state-owned, adopting sweeping state control over resources. Due to massive state interventions framed as "life blood" of agriculture (Xu et al., 2024), by 2013, China had over 500 reservoirs and some 3000 small and medium dams. These projects are what kept agriculture afloat despite periodic farming.

In energy, Mao and Deng industrialized the country with coal mines, steel and hydropower. After 2000 when environmental crises became urgent to address, China responded by massively expanding its wind and solar capacity, pledging to double its renewables by 2030. Even though China became the world's leader in renewable energy, coal still remained dominant, comprising 70% of electricity and 82% of primary energy in 2022 (Hassan et al., 2024). By contrast, India's development in energy was intermediate between pure planning and subsequent liberalization. Until the 1980s, most generation was state-built, and electricity per capita was far lower than in China. It was only in the 1990s that India began liberalizing with the passing of the Electricity Act of 2003 which opened up generation and unbundled state utilities. Although India has vigorously pursued renewables with 89% of new capacity additions supplied by solar or wind energy in 2024-25, coal supplies 77% of its electricity (Press Information Bureau, 2025).

The divergent results in the WEF nexus are the most prominent in water management. Whereas in China, the state owns and can directly invest in water infrastructure, India's constitution makes water a state subject which leads to piecemeal projects and inter-state water disputes. In the early 2000s, China planned to spend \$600 billion on irrigation projects over 10 years, which was more in a year than India's entire \$70 billion Five-Year plan allotment for major irrigation (Global Water Partnership, 2013). Following the broader trend, by the 2010s, China and India had roughly equal total irrigated area, but the former achieved it with much swifter investment. This was made possible by China's central reforms coupled with local incentives, wherein local officials were rewarded for meeting growth targets, leading to faster decision-making on projects (Chen et al., 2024). Contrarily, India's federalism makes multiple channels available to farmers and citizens to challenge projects which can bring them to a halt. For example, India's planned river-linking initiatives that aimed to rebalance water from surplus to deficit basins, could never see the light of day because of litigation cases and state resistance, whereas China completed its South–North Water Transfer by 2014 to divert Yangtze water northward. Further, while China has restricted groundwater pumping by mainly relying on canals, India has heavily subsidized electricity as mentioned earlier, which has caused overdraft in certain regions. Therefore, India's separate subsidies for energy and water sectors often resulted in worsening nexus outcomes, when China was able to avoid such cross-subsidy mismatches by keeping water and land under unified state control.

So, where did the divergence occur? Broadly, China's historical trajectory produced a system in which cross-sector investments and reforms could be imposed from the top with relative unity for gaining political points, but India's path dependencies have kept sectors siloed owing to federalist structures and misaligned incentives; H1 and H4 capture this. In the case of China, H3 shows how China's leadership under Xi has diverged from China's fragmentary past by using its party-state power to enforce cross-sector targets. H2 adds nuance to this discussion by highlighting the role of crises in prompting alignment in both countries, but without new institutions they fade. Although both countries now recognize nexus integration to manage environmental trade-offs in light of the climate crisis, policy coordination has been

stronger in China due to central plans and grassroots accountability, and weaker in India because of historical choices that continue to linger in the WEF nexus. The overall implication of this discussion is that institutionalizing coordination is key to significant nexus outcomes. Creating task-forces can be futile unless they are formalized.

### **Recommendations For India's WEF Nexus**

Strengthening institutional coordination and incentive alignment across the WEF sectors are crucial steps towards achieving equitable outcomes. This can take the form of a high-level Nexus Coordination Commission under the Prime Minister's office or an empowered NITI Aayog unit that would set joint WEF targets and monitor their implementation. These bodies should have the convening power to assemble all relevant ministries and state governments in regular dialogue to ensure both vertical and horizontal coordination. Importantly, financial incentives and budgets should be realigned to mitigate trade-offs. For instance, energy subsidies should be rationalized or attached to water-use efficiency and agricultural productivity goals to ensure judicious use of these resources. Presently, this is addressed under separate laws, which causes policy misalignment. A cross-referencing clause or joint regulatory mechanism would create built-in incentives for efficient resource use. This could be complemented with a constitutional insertion, explicitly recognising WEF nexus in the Constitution, similar to the Environmental Protection Act that followed the 42nd Amendment. This could mandate integrated river basin planning as a national priority; to facilitate this, I propose the establishment of statutory bodies such as River Basin Councils which will have the legal authority to create binding allocation plans. The recurrent failure of crisis committees to persist implies the need for legal status, not just ad hoc orders.

Additionally, capacity-building is key to ensure procedural efficiency and adaptability – central and state agencies should be trained in nexus thinking, data sharing and systems analysis. Each responsible ministry should establish working groups on Nexus issues with dedicated budgets and staff, and Parliament could require cross-sectoral impact assessments. Finally, incentives for subnational coordination can further help overcome India's federal silos.

At the regional and international level, global policymakers and stakeholders can advocate for a nexus approach by mainstreaming cross-sector coordination in international climate agendas. Multi-lateral forums can also encourage integrated resource planning by their member states by including WEF nexus targets in their agreements. Knowledge-sharing networks can disseminate best practices and tools for coordination. Relatedly, investment in data and institutions is also critical. Finally, global bodies should also encourage participatory approaches to WEF planning like engaging farmers, civil society and utilities.

Figure 2

*Policy Reform Framework for WEF coordination*

**Identified Challenges**

H1: Ministerial Silos + Turf Protection  
 H2: Crisis + Temporary Coordination  
 H3: Weak Enforcement + No Sustained Integration  
 H4: Historical Path Dependency

**Policy Reform Entry Points**

Legal Integration  
 Budget Alignment  
 Institutional Mechanisms  
 Capacity & Data Integration

**Strategic Outcomes**

Sustained Inter-Ministerial Coordination  
 Incentive Alignment Across WEF Sectors  
 Reduction of Policy Contradictions  
 Crisis-Resilient Nexus Governance

**Long Term Structural Impact**

Integrated Water–Energy–Food Security  
 Social & Ecological Equity in Resource Planning  
 Institutional Learning & Adaptability

As a necessary side note, it is important to acknowledge the often-overlooked social dimensions within WEF planning. The sectors of water, energy, and food employ a significant proportion of marginalized and underserved populations, who risk being further excluded when policy focus becomes

narrowly fixated on technical or efficiency-driven “quick fixes” (Müller-Mahn et al., 2022). Feminist and critical development studies have long argued that subjectivity, power relations, and social hierarchies are deeply embedded in the governance and allocation of natural resources (Sultana, 2009). Therefore, a truly holistic nexus approach must extend beyond economic coordination to incorporate issues of inequality, social justice, and political representation. Only by situating the nexus within these lived realities can policy frameworks avoid reproducing existing disparities and instead promote equitable and sustainable outcomes. The figure below illustrates the policymaking process in the WEF nexus.

Figure 3

*Policy Cycle in WEF nexus*



## Limitations

This study has a few limitations, primarily because of its qualitative nature, but also because of data constraints. The findings presented in this study are context-specific and not generalizable statistically. That is because although India and China were chosen for their contrast, it leaves open whether these conclusions hold for other countries. Apart from this, my interpretation of events is subject to uncertainty because some causal links, e.g. bureaucratic incentives, are inferred rather than directly

observed. The same is true for the evidentiary tests employed; they do not preclude rival explanations that may explain the hypotheses as well as the causal events I picked. Finally, the evolving nature of policies naturally changes the narrative in due time. In sum, while the PT approach opens the “black box” of causality, it cannot establish absolute proof. However, it does provide a possible narrative based on the best available evidence.

## **Conclusion**

This comparative study has highlighted the deep political-institutional differences between India and China behind their diverging WEF nexus outcomes. Despite similar water, energy and food pressures, India still struggles with misaligned bureaucratic incentives and colonial-era policy legacies that reinforce sectoral silos.

Its federal, democratic system lacks a central enforcer to sustain cross-sector initiatives, so coordination efforts appear only around crises and quickly dissipate. China’s experience has been markedly different: Xi Jinping’s government has imposed binding cross-cutting targets and created integrated agencies that enforce unified WEF goals, embedding the nexus into an ecological civilization framework. While China’s past was also fragmented, the party-state’s command-and-control capacity has largely overridden those old paths when needed.

The implications are clear: effective nexus governance requires institutional change. Acknowledging interdependencies is not enough; governments must realign incentives and formalize integration. For India, this means creating empowered cross-ministerial bodies or laws that lock in coordination, and tackling subsidy regimes that distort one sector at the expense of others. For China, it means ensuring that central mandates are well-communicated and that local authorities are held accountable in practice. More generally, our findings suggest that any country seeking to improve WEF security should consider the political feasibility of coordination reforms, not just the technical solutions.

Ultimately, this study contributes to broader debates on the nexus by highlighting that political economy factors – incentives, institutional mandates, and history – continuously shape what is possible in cross-sector policy. It shifts the focus from modeling trade-offs to understanding governance. Future research could examine how other countries navigate similar challenges, or track whether recent reforms change the coordination story. As resource constraints and climate pressures mount, unlocking the WEF nexus will depend as much on institutional innovation as on technical ingenuity.

## References

- Ahuja, K. (2025, February 28). Mechanisms for Inter-Ministerial Coordination in India: Resolving Contradictions in Cross-Ministerial Projects. *Bhatt & Joshi Associates*.  
<https://bhattandjoshiassociates.com/mechanisms-for-inter-ministerial-coordination-in-india-resolving-contradictions-in-cross-ministerial-projects/>
- Badiani-Magnusson, R., & Jessoe, K. (2018). Electricity Prices, Groundwater, and Agriculture: The Environmental and Agricultural Impacts of Electricity Subsidies in India. In *Agricultural Productivity and Producer Behavior* (pp. 157–183). *University of Chicago Press*. <https://www.nber.org/books-and-chapters/agricultural-productivity-and-producer-behavior/electricity-prices-groundwater-and-agriculture-environmental-and-agricultural-impacts-electricity>
- Bakvis, H., & Brown, D. (2010). Policy Coordination in Federal Systems: Comparing Intergovernmental Processes and Outcomes in Canada and the United States. *Publius*, 40(3), 484–507. <https://www.jstor.org/stable/40865319>
- Beach, D. (2016). It's all about mechanisms – what process-tracing case studies should be tracing. *New Political Economy*, 21(5), 463–472.  
<https://doi.org/10.1080/13563467.2015.1134466>
- Bhagirath. (2025, January 31). Economic Survey 2025: Employment increased in agriculture sector, decreased in manufacturing and services. *Down To Earth*.  
<https://www.downtoearth.org.in/agriculture/economic-survey-2025-employment-increased-in-agriculture-sector-decreased-in-manufacturing-and-services>

- Bolognesi, T., Metz, F., & Nahrath, S. (2021). Institutional complexity traps in policy integration processes: A long-term perspective on Swiss flood risk management. *Policy Sciences*, 54(4), 911–941. <https://doi.org/10.1007/s11077-021-09443-1>
- Chen, X., Jiang, H., & Ling, J. (2024). Addressing Multitasking Problems through Promotion Incentives: An Empirical Study of Local Governments in China. *Public Performance & Management Review*, 47(3), 654–680. <https://doi.org/10.1080/15309576.2024.2302390>
- Economic and Political Weekly. (2024, August 22). A Parched Nation: Analyzing India’s Water Scarcity Challenges. <https://www.epw.in/engage/article/parched-nation-analyzing-indias-water-scarcity>
- Freeman, C. (2011). Quenching the Dragon’s Thirst The South-North Water Transfer Project—Old Plumbing for New China?
- Collier, D. (2011). Understanding Process Tracing. *PS: Political Science & Politics*, 44(4), 823–830. <https://doi.org/10.1017/S1049096511001429>
- Freeman, C. (2011). Quenching the Dragon’s Thirst The South-North Water Transfer Project—Old Plumbing for New China? *Wilson Center*. <https://www.wilsoncenter.org/publication/quenching-the-thirsty-dragon-the-south-north-water-transfer-project-old-plumbing-for-new>
- Gao, J., Wang, Y., Zou, C., Xu, D., Lin, N., Wang, L., & Zhang, K. (2020). China’s ecological conservation redline: A solution for future nature conservation. *Ambio*, 49(9), 1519–1529. <https://doi.org/10.1007/s13280-019-01307-6>

- Global Water Partnership. (2013). *Water and food security: Experiences in India and China*.  
<https://www.gwp.org/globalassets/global/toolbox/publications/technical-focus-papers/03-water-and-food-security---experiences-in-india-and-china-2013.pdf>
- Gu, A., Teng, F., & Wang, Y. (2014). China energy-water nexus: Assessing the water-saving synergy effects of energy-saving policies during the eleventh Five-year Plan. *Energy Conversion and Management*, 85, 630–637.  
<https://doi.org/10.1016/j.enconman.2014.04.054>
- Hansen, M. H., Li, H., & Svarverud, R. (2018). Ecological civilization: Interpreting the Chinese past, projecting the global future. *Global Environmental Change*, 53, 195–203.  
<https://doi.org/10.1016/j.gloenvcha.2018.09.014>
- Hassan, Q., Algburi, S., Sameen, A. Z., Al-Musawi, T. J., Al-Jiboory, A. K., Salman, H. M., Ali, B. M., & Jaszczur, M. (2024). A comprehensive review of international renewable energy growth. *Energy and Built Environment*. <https://doi.org/10.1016/j.enbenv.2023.12.002>
- Jain, A. (2022). Democratic Decay in India: Weaponising the Constitution to Curb Parliamentary Deliberation. *National Law School of India Review*, 34(1), [i]-276.  
<https://repository.nls.ac.in/nlsir/vol34/iss1/9/>
- Jiang, B., Bai, Y., Wong, C. P., Xu, X., & Alatalo, J. M. (2019). China's ecological civilization program—Implementing ecological redline policy. *Land Use Policy*, 81, 111–114.  
<https://doi.org/10.1016/j.landusepol.2018.10.031>
- Jin, S., Mei, Z., & Duan, K. (2022). Coupling Coordination of China's Agricultural Environment and Economy under the New Economic Background. *Agriculture*, 12(8), 1147.  
<https://doi.org/10.3390/agriculture12081147>

- Kay, A., & Baker, P. (2015). What Can Causal Process Tracing Offer to Policy Studies? A Review of the Literature. *Policy Studies Journal*, 43(1), 1–21.  
<https://doi.org/10.1111/psj.12092>
- Kou, C., Meng, D., & Gu, F. (2025). Water-Energy-Food Nexus coupling coordination across Chinese provinces: Spatiotemporal evolution and interactive effects of influencing factors. *Environment, Development and Sustainability*. <https://doi.org/10.1007/s10668-025-06689-0>
- Lapicciarella, A. (2015). On Bureaucratic Behavior. In M. Di Bitetto, A. Chymis, & P. D'Anselmi (Eds.), *Public Management as Corporate Social Responsibility: The Economic Bottom Line of Government* (pp. 103–118). *Springer International Publishing*.  
[https://doi.org/10.1007/978-3-319-07037-7\\_9](https://doi.org/10.1007/978-3-319-07037-7_9)
- Lele, U., Klousia-Marquis, M., & Goswami, S. (2013). Good Governance for Food, Water and Energy Security. *Aquatic Procedia*, 1, 44–63. <https://doi.org/10.1016/j.aqpro.2013.07.005>
- Lema, A., & Ruby, K. (2006). Towards a policy model for climate change mitigation: China's experience with wind power development and lessons for developing countries. *Energy for Sustainable Development*, 10(4), 5–13. [https://doi.org/10.1016/S0973-0826\(08\)60551-7](https://doi.org/10.1016/S0973-0826(08)60551-7)
- Li, W., & Yang, D. T. (2005). The Great Leap Forward: Anatomy of a Central Planning Disaster. *Journal of Political Economy*, 113(4), 840–877. <https://doi.org/10.1086/430804>
- Manazir, S. H. (2025). Public policy formulation or policy panopticon? Revisiting the role of political elites in policymaking. *Humanities and Social Sciences Communications*, 12(1), 626. <https://doi.org/10.1057/s41599-025-04915-8>

- Misra, T. (n.d.). The Invention of Corruption: India and the License Raj. The London School of Economics and Political Science.  
<https://www.journalofpoliticalscience.com/uploads/archives/7-6-8-891.pdf>
- Mooij, J. (1998). Food policy and politics: The political economy of the public distribution system in India. *The Journal of Peasant Studies*, 25(2), 77–101.  
<https://doi.org/10.1080/0306615980843866>
- Müller-Mahn, D., Gebreyes, M., Allouche, J., & Debarry, A. (2022). The Water-Energy-Food Nexus Beyond “Technical Quick Fix”: The Case of Hydro-Development in the Blue Nile Basin, Ethiopia. *Frontiers in Water*, 4. <https://doi.org/10.3389/frwa.2022.787589>
- Peters, B. G. (1998). Managing Horizontal Government: The Politics of Co-Ordination. *Public Administration*, 76(2), 295–311. <https://doi.org/10.1111/1467-9299.00102>
- Peters, B. G. (2018). The challenge of policy coordination. *Policy Design and Practice*, 1(1), 1–11. <https://doi.org/10.1080/25741292.2018.1437946>
- Press Information Bureau. (2025, May 6). *Energizing the Future: POWERup Q1 2025 Highlights*. <https://pib.gov.in/FactsheetDetails.aspx?Id=149218>
- Qin, Q., He, W., Yuan, L., Degefu, D. M., & Ramsey, T. S. (2025). Coupled and coordinated development of water-energy-food-ecology-land system in the Yangtze River Delta, China. *Npj Clean Water*, 8(1), 38. <https://doi.org/10.1038/s41545-025-00472-4>
- Rasul, G., & Neupane, N. (2021). Improving Policy Coordination Across the Water, Energy, and Food, Sectors in South Asia: A Framework. *Frontiers in Sustainable Food Systems*, 5. <https://doi.org/10.3389/fsufs.2021.602475>

- Ricks, J. I., & Liu, A. H. (2018). Process-Tracing Research Designs: A Practical Guide. *PS: Political Science & Politics*, 51(4), 842–846.  
<https://doi.org/10.1017/S1049096518000975>
- Sim, T., & Yu, J. L. (2018). Natural Hazards Governance in China. *Oxford Research Encyclopedia of Natural Hazard Science*.  
<https://oxfordre.com/naturalhazardscience/display/10.1093/acrefore/9780199389407.001.0001/acrefore-9780199389407-e-239?d=%2F10.1093%2Facrefore%2F9780199389407.001.0001%2Facrefore-9780199389407-e-239&p=emailAwLeAGW8ePBys>
- Sultana, F. (2009). Fluid lives: Subjectivities, gender and water in rural Bangladesh. *Gender, Place & Culture*, 16(4), 427–444. <https://doi.org/10.1080/09663690903003942>
- Taylor, M., & Garlick, J. (2025). ‘Flexible’ versus ‘fragmented’ authoritarianism: Evidence from Chinese foreign policy during the Xi Jinping era. *Australian Journal of International Affairs*, 79(2), 189–208. <https://doi.org/10.1080/10357718.2024.2437035>
- The Hindu. (2015, March 19). *When the big dams came up*. <https://www.thehindu.com/todays-paper/>
- The Times of India. (2025, February 21). *Ken-Betwa linking project: Experts claim project “politically motivated”, shouldn’t have been approved*.  
<https://timesofindia.indiatimes.com/india/ken-betwa-linking-project-experts-claim-project-politically-motivated-shouldnt-have-been-approved/articleshow/118447235.cms>
- Trampusch, C., & Palier, B. (2016). Between X and Y: How process tracing contributes to opening the black box of causality. *New Political Economy*, 21(5), 437–454.  
<https://doi.org/10.1080/13563467.2015.1134465>

- Trein, P., Biesbroek, R., Bolognesi, T., Cejudo, G. M., Duffy, R., Hustedt, T., & Meyer, I. (2021). Policy Coordination and Integration: A Research Agenda. *Public Administration Review*, 81(5), 973–977. <https://doi.org/10.1111/puar.13180>
- Xu, Q., Boelens, R., & Veldwisch, G. J. (2024). The evolution of China's rural water governance: Water, techno-political development and state legitimacy. *The Journal of Peasant Studies*, 51(3), 717–737. <https://doi.org/10.1080/03066150.2023.2261860>
- Zafar, S., Aarif, M., & Tarique, Md. (2023). Input subsidies, public investments and agricultural productivity in India. *Future Business Journal*, 9(1), 54. <https://doi.org/10.1186/s43093-023-00232-1>
- Zahedi, R., Yousefi, H., Aslani, A., & Ahmadi, R. (2024). System dynamic model of water, energy and food nexus for policy implementation. *Applied Water Science*, 14(10), 213. <https://doi.org/10.1007/s13201-024-02279-z>
- Zhou, C., Chen, J., Li, C., & Bi, B. (2024). Territorial Pluralism in China: Local Water Users' Adaptation Strategies in the South–North Water Transfer Project. *Water*, 16(6), 885. <https://doi.org/10.3390/w16060885>