Stockholm Environment Institute

The water-energy nexus: comparing how Los Angeles and Beijing integrate policies across sectors

SEI brief
December 2019

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Key Findings:

- **By integrating policies across sectors, policy-makers can better see trade-offs and synergies, and thus ensure that policies in one sector do not negatively impact policies in another sector.**
- **To ensure a stronger water-energy nexus, policy-makers should adopt explicit incentives for integrating water and energy policies.**
- **Cross-sector goals, such as mitigating climate change, are important drivers of water-energy nexus policy integration.**
- **Common policy evaluation criteria across sectors, such as greenhouse gas emissions, are fundamental to improving policy coherence.**

As concerns about water scarcity and energy security increase, it can be beneficial to take a holistic view of water and energy policy and infrastructure. Examining both the water and energy sectors together – and studying the ways they interact – can help policy-makers plan for a changing climate, as well as economic and demographic shifts.

This brief considers the water-energy nexus (WEN) in Los Angeles and Beijing, two of the largest cities in the United States and China, respectively. The US and China play important roles in the global water-energy nexus; together, they account for 33% of global energy production, 38% of global energy consumption, and 27% of global water withdrawals[1].

In this brief, we assess the policy coherence between the water and energy sectors in each city, examining the degree to which policies in one sector work in sync with the other sector. The more in sync, the greater the reliability of the sector and resource.

We also look at the policies' institutional settings, and then highlight some of the key enabling and hindering factors for cross-sectoral policy integration.

Methods

To assess the level of policy integration supported by the Los Angeles (LA) and Beijing political contexts, we used a comparative case study research design that was informed by political systems approaches. For each city, we highlighted the role of institutions in enabling or hindering water-energy policy integration at the subnational level. We utilized

IMAGE (ABOVE): Lake Hollywood Reservoir

1 Figures taken from the International Energy Agency's 2016 Key World Energy Statistics and from the Food and Agriculture Organization's Information System on Water and Agriculture (www.fao.org/nr/water/aquastat/countries/index.stm).

Table 1: Questions used in assessment of water-energy nexus in LA and Beijing.

Key EPI roles and elements	Key questions under each EPI to be asked
External factors (motivation)	
Resource, social, economic, political	• To what extent did the pressures imposed from resource efficiency/security and socio-political factors motivate the water-energy EPI?
Steering the EPI process	
Initiating institutions and organizational arrangement	• What are the institutions that support WEN cross-sectoral coordination? • What are the institutional programs/initiatives/measures which support WEN cross-sectoral coordination? • Are there demonstrated benefits from the above coordination?
Enabling the EPI process	
Financial and budgetary structure; Technical capacity; Human resources	• To what extent has there been budget specifically allocated or a budgetary structure enabled to achieve EPI objectives? • Are there shared evaluation procedures, approaches, tools among water and energy sectors? • Is there enough relevant human resource capacity present for achieving EPI objectives?
Facilitating the EPI process	
Communication structure; Stakeholder involvement; Networking; Learning	• Are there formal regulations, networks or stakeholder involvement mechanisms for communication? • Do informal relations play a role in policy coherence? • To what extent is there training and carryover of institutional knowledge?
EPI outcome	
Criteria to evaluate policy success	• What are the formal/mandated criteria to evaluate policy success in each sector? Are they aligned with each other?

the principles established within the field of environmental policy integration (EPI)[2] to assess how well the subnational contexts steer, enable, and facilitate policy integration between the water and energy sectors. Table 1 lists the key questions we used to conduct this analysis, under each EPI category considered.

Results

Los Angeles

Enabling elements of Los Angeles' governance setting

California is well known for leading efforts within the US to curb climate change, and most water-energy policy integration in Los Angeles is closely linked to state-level climate initiatives. The California Global Warming Solutions Act of 2006, Assembly Bill (AB) 32, established the legislative authority and common policy objectives for cross-sector coordination, providing a common language for the energy and water sectors in their respective policy-making processes. Numerous state policies explicitly steer companies and utilities to reduce consumption of energy and water.

Within both the water and energy sectors, there are also implicit initiatives that have cross-sectoral benefits. In the energy sector, increasing renewable energy and strengthening end-use standards serve to reduce greenhouse gas (GHG) emissions and energy use for the water sector. In the water sector, increasing local sourcing reduces the energy used in importing water.

The state government both invests in and provides incentives for greater environmental policy integration. Additionally, several channels for communication between stakeholders in the water and energy sectors exist. In both sectors, climate targets and resource efficiency are key evaluation criteria for success.

2 For an introduction to EPI, see: https://www.sei.org/publications/environmental-policy-integration-introduction/

Hindering elements of Los Angeles' governance setting

Given the rapidly increasing cost of maintaining secure water supplies in California, energy use increasingly holds only secondary importance for water utilities concerned with providing sufficient and safe drinking water. Despite energy's impacts on operations and costs, there is little incentive for water utilities to conserve energy, as they are able to pass the cost on to customers.

Beijing

Enabling elements of Beijing's governance setting

Since 2006, resource efficiency has been central to China's five-year economic and social development plans. Though the water-energy nexus (WEN) is not referred to explicitly, national policies include numerous targets and objectives that are both binding and WEN-relevant. At the Beijing level, there are agencies involved in both water and energy policy formation, including the Beijing Municipal Development and Reform Commission, the Beijing Municipal Commission of Housing and Urban-Rural Development, the Beijing Municipal Administration of Quality and Technology Supervision, the Beijing Water

Table 2: A comparison of the water-energy nexus in Los Angeles and Beijing.

WEN Governance evaluation criteria	Los Angeles WEN Governance	Beijing WEN Governance
External pressures (motivation)		
Resource, social, economic and political context	Due to resource scarcity, water security and sustainability are the top concerns for water regulators and utilities. Energy for water is largely driven by mandated climate targets and to some degree by the concern for economic viability—it is expensive to move water around in California.	A few WEN issues are explicitly mentioned at the national level, driven by concerns of pollution and water resource scarcity. In Beijing, water scarcity issues are much higher on the policy agenda than energy. WEN policy is set mainly at the national level, while implementation is delegated to lower government levels.
Steering the EPI process		
Initiating institutions and organizational arrangement	Both explicit and implicit steering mechanisms are present in California, largely driven by the climate legislation AB32 (implicit). Many other water-energy relevant legislative mechanisms and regulations have been introduced following AB32. Organizational arrangements, such as the inter-agency team WET-CAT, were created to coordinate efforts to primarily address the climate/energy impacts of the state's water system. There are some elements of state-local coordination (for example between utilities and the California Public Utilities Commission and the California Energy Commission), and, to some degree, the coordination efforts remain at the state level.	The initiating institutions are primarily at the national level, although Beijing has initiated an integrative governance arrangement by creating the Beijing Water Authority (BWA) and by introducing consumption standards for wastewater treatment plants (a WEN policy mechanism). Still, WEN governance measures remain mostly implicit, and there are no WEN-specific indicators to monitor their effectiveness. In terms of organizational arrangements, there is no agency to explicitly coordinate water-energy policy-making and implementation.
Enabling the EPI process		
Financial and budgetary structure; Technical capacity	Intersectoral funding is provided by both public agencies (for example, via revenues from cap and trade) and also from utilities. It is unclear whether this funding is sufficient to mitigate the climate impacts of the water sector as required. Besides financial resources, technical frameworks have been developed for GHG accounting and cost-benefit analysis under several legislatively established WEN programs.	Beijing has considerable financial resources available for investing in WEN measures. However, there are no explicit financial mechanisms for WEN governance. In addition, "cadre" incentive structures and the technocratic nature of implementing agencies do not work in favor of cross-sectoral governance.
Facilitating the EPI process		
Communication structure; Stakeholder involvement; Learning	The presence of an inter-agency organization (WET-CAT) has provided an institutionalized channel to facilitate both vertical (between state and local) and horizontal (between water and energy sectors) communication on EPI issues.	While there have been improvements in the disclosure of environmental information, public access to information remains restricted. Overall, the way authority and rank influence policy-making goes against cross-sectoral governance.
EPI outcome		
Criteria to evaluate policy success	Despite differences in sectoral priorities, having the common evaluation criteria in place (i.e., climate targets, efficiency) is critical for the water and energy sectors to evaluate their own policy success.	The cadre annual evaluation system provides increasing incentives for public officials to balance environmental health and resources efficiency with economic growth. However, important gaps remain between ambitions set at the national level and policy outcomes at the local level, and none of the targets being evaluated for cadre performance is about cross-sectoral efficiency.

Authority, and the Beijing Municipal Bureau for Environmental Protection. China has several policy instruments that support policy planning within the water-energy nexus, including a new volume-based water resource tax piloting scheme.

Resource efficiency standards in both sectors serve as the main control instrument from a water-energy nexus perspective. Since 2012, key energy-consuming sectors – including thermal power and petroleum refining – have been regulated to meet water intake standards. Efficiency is a common target for both the water and energy sectors in Beijing, but it is pursued within, rather than across, sectors.

Hindering elements of Beijing's governance setting

At the national level, China places far greater emphasis on water resource constraints for energy development than on energy constraints for water. The energy and water sectors develop policies and targets separately from one another, and there is no institution that coordinates governance between the two sectors.

In China, environmental policy primarily focuses on pollution rather than resource efficiency, which is more of a sector-specific objective. The environmental public spending structure in Beijing does not appear to be conducive to WEN-integrated governance. Overall, the way authority and rank influence policy-making in China tends to discourage cross-sectoral governance.

Conclusions

In both Los Angeles and Beijing, concerns about water scarcity are greater than they are for energy supply. However, the impacts of energy – in the form of air pollution, greenhouse gas emissions and dependence on imports – may be of equal or greater concern.

In California, there is a formal institution that specifically addresses water-energy nexus issues (Water-Energy Team of the Climate Action Team, or WET-CAT), while in Beijing, policy targets and implementation mechanisms are set up separately for each sector. Additionally, while Los Angeles utilizes common technical frameworks and indicators for both water and energy policy, Beijing does not. A detailed comparison, applying the environment policy integration (EPI) framework, is shown in Table 2.

Overall, Los Angeles has more explicit mechanisms for policy integration, while Beijing uses more implicit mechanisms.

The result is that both water and energy agencies and utilities in Los Angeles (and in California more widely) are aware of each other's consumption and GHG emissions. This appears to be less the case in Beijing, where there is an absence of explicit water-energy nexus incentives and awareness. As a result, some policies in the water and energy sectors in Beijing work at cross purposes, when integration could benefit sustainability in both sectors.

This brief is based on the forthcoming paper, *Assessing the Level of Inter-Sectoral Policy Integration for Governance in the Water-Energy Nexus: A Comparative Study of Los Angeles and Beijing*, by Gregory N. Sixt, Claudia Strambo, Jingjing Zhang, Nicholas Chow, Jie Liu, and Guoyi Han. This work was supported by the U.S. Department of Energy and The Regents of the University of California under Award No. DE-IA0000018. It was also funded by the University of California Berkeley and the Swedish International Development Cooperation Agency (Sida), which does not necessarily share the views expressed in this material.

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