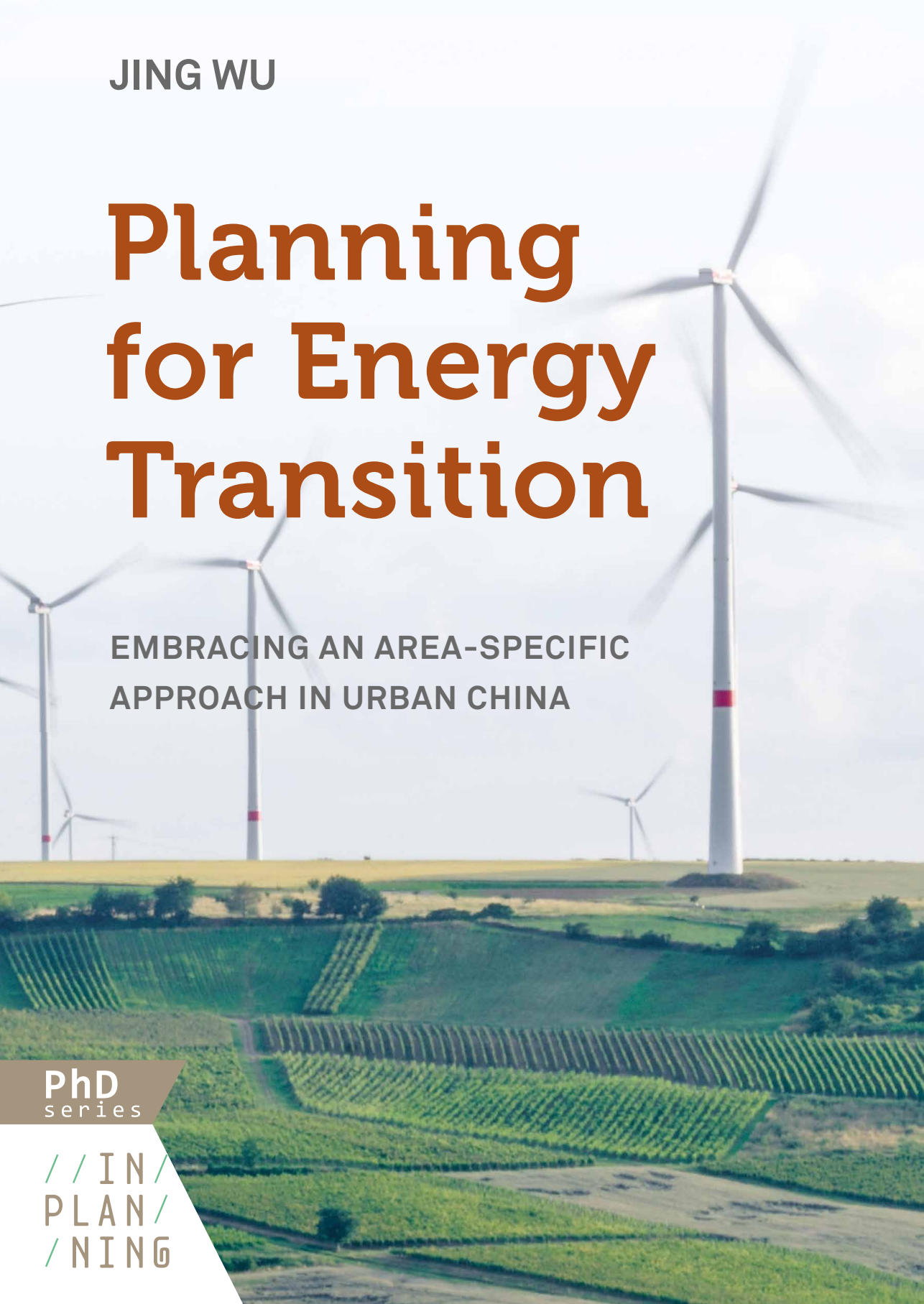
JING WU

Planning for Energy Transition

EMBRACING AN AREA-SPECIFIC APPROACH IN URBAN CHINA



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Planning for Energy Transition

Embracing an Area-Specific Approach in Urban China

PhD thesis

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For Dad and Mom

I'm often asked whether I believe in Global Warming.
I now just reply with the question: "Do you believe in Gravity?"

– *Neil deGrasse Tyson*

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SUMMARY

Climate change is an increasingly urgent global crisis, which is largely due to greenhouse gases (GHG) that have been emitted into the atmosphere as a result of human activity. With fossil fuel combustion being among the prime causes of this emission, energy transition is among the prime issues calling for urgent attention if humans are to mitigate the effects of climate change. Energy transition mainly involves the shift from a fossil fuel-based energy system towards a more sustainable and renewables-based energy system. Meanwhile, cities are considered to be vital battlefields for addressing the energy transition. This PhD thesis specifically examines urban China, acknowledging China is arguably one of the most important countries in terms of global climate action.

Energy transition is a highly complex, dynamic and multi-dimensional process involving a multitude of actors and networks. This complexity is also reflected in the underlying processes and practices towards energy transition that vary spatially due to different local circumstances. Therefore, energy transition mainly relies on the interplay of technical, social, and institutional innovations in a geographical setting, implying a need for particular assemblages that vary over space and time. Managing such a complex and interrelated policy issue, which is also spatially sensitive, requires a suitable institutional design and related planning approaches.

This PhD thesis addresses two important and ongoing shifts in the governance of energy transition: 1) a shift from government to governance, and 2) increased decentralization and use of area-specific approaches. Firstly, there is a recognition that relying on a top-down 'government based' approach and its associated command-and-control style of working is incompatible with to solving complex issues. In response, the organization and exercise of power and authority is undergoing important changes into 'governance'; implying a more fluid sharing of power and authority both between governmental levels and between governments and non-governmental actors. Secondly, there is a realization that decentralization is a pathway for increasing the governance capacity to develop an 'area-specific' approach that can effectively bring collaborating and competing stakeholders together in a locally-grounded governance network. Specifically, including more decentralized and area-specific approaches for energy transition governance is considered to be crucial. After

all, it allows relevant stakeholders to exert influence over the complex issues they face in their own areas. This study is particularly interested in how both these possible changes in energy governance can work out within the Chinese top-down political scheme.

Until today, China's political system remains strongly based on top-down planning, developing blueprints and relying on a command-and-control approach to policy implementation. In this centralized governance system, Chinese local authorities have to comply with sectoral policy targets developed by the national government. In its current design, the Chinese policy framework is likely to create challenges for local authorities who seek to implement potentially incompatible or even conflicting policy ambitions at a local urban scale. After all, local authorities have to achieve mandatory sectoral objectives set by higher levels of government (e.g., energy efficiency) while simultaneously balancing and dealing with other local or nationally-mandated priorities (e.g., economic growth, employment, transportation). Given the potential challenges associated with such balancing, the overarching aim of this research is to advance our understanding of how local energy governance and its policy outcomes are shaped within the Chinese centralized governance system.

Research Design

The research objective is translated into the following research question:

How is local energy governance in China shaped and developing, given the national policy attempts and strategies in pursuing energy transition? And what are the constraints and opportunities for pursuing area-specific energy governance approaches in Chinese urban areas?

In answering the main research question, this research uses two analytical lenses for studying the institutional design of Chinese urban energy governance. The first lens is that of policy implementation, with a focus on how national energy policies are impacting local energy governance. The second lens is that of integrated and collaborative strategies at a local level, with a focus on cross-sectoral working within governments and between governments and other societal stakeholders.

These two analytical lenses will be presented in the following sub-questions structuring the overall study:

1. **Top-down policy framework**
   How does the Chinese top-down policy framework for energy efficiency function when applied under different local circumstances?

2. **Decentralized policy experiment**
   Which are the key constraints that Chinese local authorities face regarding the development and implementation of local energy policies, and how does this affect their willingness and ability to do so?

3. **Policy integration (within governmental sectors)**
   How is policy integration on energy transition pursued in urban China, and how does Chinese centralized governance allow for, or constrain, local integrated energy policies?

4. **Stakeholder collaboration (government and non-government actors)**
   How are local collaborative energy practices shaped by existing institutional rules and regulations; how are the roles of actors defined in Chinese energy governance? What are the barriers and opportunities to multi-stakeholder collaboration?

This study adheres to a qualitative research strategy, which aims to investigate the impacts of national and local Chinese energy policies at the local scale in China. The aim of using case studies in this study is to gain an in-depth understanding of how local authorities themselves develop and pursue energy transition policies and practices, and which types of problems and opportunities arise in the current energy governance system at a local scale. This PhD thesis has deliberately selected eight varied case studies in total, which are, respectively, researched with the goal of answering each question in different steps and presented as separate chapters (Chapter 2 to 5).

The methods used in this research mainly comprise in-depth interviews and policy document analysis. Between November 2015 and 2019, 90 interviews were carried out with stakeholders in eight selected cities, and also Beijing (with national government and national scientific organizational representatives who were involved in the policy implementation, or more generally in decision-making for Chinese energy transition). The interviews were conducted in a semi-structured way. All interviews were audio-recorded, and the average duration of each interview was between 45-60 minutes. The policy document analysis comprised of two different kinds of documents: (1) *primary* documents, including plans, policy documents, strategies, legislation and guidelines, and (2) *secondary* documents such as research reports, journal articles, newspapers and websites. All data were transcribed, coded and analyzed with the support of the computer program Atlas.ti. The findings below are structured along the four sub-questions, with references to the specific chapters.

Does top-down policy strategy work well in Chinese energy governance…
Sub-question 1: How does the Chinese top-down policy framework for energy efficiency function when applied under different local circumstances?

Chapter 2 introduces the concepts of conformance and performance in relation to policy implementation of energy governance, and investigates how the Chinese top-down and conformance-oriented system impacts policy implementation regarding the energy transition. Specifically, it identifies how policy design of target setting and evaluation is both impacting and driving the implementation of energy efficiency policies and actions at the local urban scale. This chapter draws on empirical insights from four cases with varied urban conditions: Hohhot, Lanzhou, Yangzhou, and Chengdu.

This study shows that top-down target setting in Chinese national energy governance can easily risk to be insensitive to the wide variation between local contexts. Notably, it is hard for the central government to have the available knowledge of local differences to set the 'right' targets for every context. Failing to take varying local circumstances into account in national regulations, can be among the causes for lower levels of policy performance at the local level. Chapter 2 shows key examples where the top-down policy framework for national energy production and efficiency in China overlooks the hardships and struggles of specific regions and cities to meet the allocated targets. For instance, economically weaker cities like Lanzhou and Hohhot felt they were being confronted with unrealistic demands to not only combine targets for economic growth with energy transition objectives, but also to conform to similar targets as economically stronger cities such as Chengdu and Yangzhou. These targets in Lanzhou and Hohhot, thus, created a serious conflict with alternative policy priorities that local authorities also have to meet, notably GDP growth and employment. Such a conflict eventually led to last-minute improvisation practices during official state induced inspections in these cities, arguably resulting in more optimistic evaluation outcomes than would be warranted based on the actual local performance. Alternatively, the relatively generic target setting approach was also ill-adapted to provide sufficient incentives in more advanced cities; for example, for Yangzhou and Chengdu the incentives hardly pushed them further than what already was occurring.

Another key finding of Chapter 2 is that even when relying on a top-down policy setting, the different ways of evaluating policy implementation can potentially make a big difference. Conformance-oriented policy evaluation, as our cases illustrate, can provoke a 'ticking-of-the-boxes' instead of really promoting actual performance. In this, sticking to the numbers itself becomes more important than actual investments, spatial impacts and projects, since the numbers have the final say. Therefore, a strong conformance-based governance approach might tell a superficial story and might fail to capture the actual levels of policy performance. The chapter argues for a more performance-oriented approach and increased flexibility in both target setting and the evaluation scheme in the development of a national policy framework so as to enhance effectiveness in reaching energy efficiency targets.

… However, does decentralization work as we expected in China?

Sub-question 2: Which are the key constraints that Chinese local authorities face regarding the development and implementation of local energy policies and how does this affect their willingness and ability to do so?

In Chapter 3, academic research indicates that area-specific perspectives and related decentralized governance approaches may be essential in complementing, or partly replacing, traditional centralized planning methods in the pursuit of energy transition in the local realm. Similarly, the Chinese national government has initiated projects aiming to trigger more local experimentation in line with the idea of area-based approaches. This chapter investigates whether Chinese local authorities have the willingness and ability to perform decentralized policies and tasks, and develop the desired area-based approaches

on energy transition. It then zooms in on four case study cities (i.e. Yangzhou, Nanjing, Xi'an, Dunhuang) through a national pilot program, 'New Energy Demonstration City (NEDC)', and shows how the cities express only modest willingness and ability. When compared to other local priorities, local performance is constrained by inadequate local technical and managerial ability and a possible weak profile of renewable energy as compared to (economic) development-oriented ambitions; moreover, local performance indicates a limited local scope of influence over energy transition-related challenges as much issues are outside of the local scope of influence (e.g., national gird related).

Chapter 3 confirms that the benefits of a more decentralized governance approach in the form of locally sensitive solutions, investments and area-specific solutions cannot simply be assumed to be captured locally. Insufficient local willingness and ability undermine local performance and hence, create risks for a successful strategy to promote decentralized and area-based approaches in the energy transition in China. Notably, the findings suggest we need a much more nuanced understanding of how central governments and top-down policies interact with local bottom-up governance approaches. Hence, integrating more local policy development should not ignore the role of national policies to enable and activate local authorities and stakeholders to pursue energy transition policies. On the one hand, national incentives (e.g., financial resources or political pressure) can create sufficient extrinsic motivations to stimulate local actions in pursuing energy transition. On the other hand, some degree of national support can help local authorities (especially smaller cities such as Dunhuang) with professional guidance, training and offer them expertise, ideas and experience to better deal with new tasks. In addition, the central government can set up effective regulatory frameworks to enable energy reforms that local authorities have limited influences on. Such an energy reform, for example, can be reforming the Chinese electricity market to increase the opportunities for grid access.

Is cross-sectoral and collaborative working manifested between governmental sectors in urban China then…?

Sub-question 3: How is policy integration on energy transition pursued in urban China, and how does Chinese centralized governance allow for, or constrain, local integrated energy policies?

Energy transition requires actions beyond what the energy sector alone can deliver and thus calls for a degree of policy integration. Notably in a local realm, the spatial and socio-economic implications of energy transition urge for cross-sectoral working.
Chapter 4 uses the lens of climate policy integration, which has emerged as an important strategy to respond to energy concerns in which energy issues can be governed by multiple sectors taking collective responsibility for a common objective. Subsequently, this chapter analyses how the integration of energy ambitions within non-energy sectors manifests at the local level in urban China by gaining insights from two cases: Chengdu (Low-carbon city project) and Yangzhou (New Energy Demonstration City Project).

Both the cases of Chengdu and Yangzhou clearly demonstrate that policy integration on energy issues at the local level is not self-evident. Although Chapter 4 also shows that energy ambitions are related to or integrated with non-energy sectors at a national and local level, there are hardly any local attempts at creating cross-sectoral policies. Instead, the integration strongly relies on national incentives embedded within distinct policy sectors. That is, the state uses existing sectoral policies to issue energy targets that local governments have to work with. Policy integration with this approach is typically not due to collaboration across sectors locally, but integration is pursued based on the implementation of national targets within distinct sectors or departments. The national projects studied (i.e. LCC and NEDC projects) in Chapter 4 were also not considered the joint responsibility of all relevant sectors in both two case cities (i.e. Chengdu and Yangzhou). They were instead framed as isolated or stand-alone projects solely the responsibility of the local energy department for their implementation. The main reasons uncovered in both cases is that non-energy sectors have to conform to national targets through implementing sectoral policies regardless of whether these relate to energy or not. They therefore hardly see the added value in also pursuing or contributing to integrated energy policies. Instead, complying with central government targets related to energy was already seen by most departments or sectors at the local scale as their contribution to the project implementation. Despite the fact that these projects were considered essential by most, a systematic, holistic and cross-departmental plan which is based on mutual understanding of each other's responsibilities and interests was missing in both cases studied in Chapter 4.

Top-down implementation and national sectoral incentives might result in reinforcing existing departmental tendencies to focus on their own departmental policy agenda and even create barriers in advocating for cross-sectoral working. However, Chapter 4 also finds that national policies can still play a key role in promoting policy integration in a local context. Therefore, this thesis argues for more local discretion combined with national support and incentives to enable and motivate local integrated working.

How are local collaborative energy practices shaped by existing institutional rules in China?
Sub-question 4: How are local collaborative energy practices shaped by existing institutional rules and regulations; how are the roles of actors defined in Chinese energy governance? What are the barriers and opportunities to multi-stakeholder collaboration?

Collaborative working is not constrained to what happens within governmental organizations. Clearly, with the energy transition also involving numerous societal activities, it implies collaboration between governments and alternative stakeholders. Pursuing more collaborative efforts demands an effective institutional framework that is well understood by those outside the government domain to support and trigger stakeholders to act together. **Chapter 5** analyses local collaborative energy practices in China by using an enriched version of the Institutional Analysis and Development (IAD) framework, which is originally proposed by Ostrom. In Chapter 5, we analyze how stakeholders' behaviors and action outcomes on Chinese collaborative energy practices are shaped and defined by formal institutions

(through the 'rules of the game') and how contextual practices, informal routines and interactions shape actors' behaviors and actions (i.e. the 'play of the game'). This Chapter 5 looks specifically at the decentralized photovoltaic (PV) power generation project in Guangzhou, which is an example of struggling and also pioneering that occurs in pursuing collaborative practices in a large and frontrunner city in energy transition within China. The core interest is to assess how such collaborative working is perceived and how it evolved, while addressing the perspectives from both the side of the government and other stakeholders.

Pursuing a successful collaboration among stakeholders is not that easy particularly within a strong top-down, regulatory policy framework such as in China. We identified several key problems in Guangzhou related to the structure of Chinese energy governance that are also likely to occur in other Chinese cities. Notably, we identified some important power imbalances between stakeholders and found that the grid operators hold the monopoly position in the development of the decentralized PV project. The issues of power imbalances also triggered a chain of problems in the decentralized PV project, such as financial difficulties, information opacity and ineffective supervision, and which are a major constrain to situation specific policies that build on integrated strategies and collaborative approaches. In Chapter 5, we also found *Guanxi* is an important informal practice and cultural tradition often observed in Chinese business society, but it is not easily captured by the original IAD framework. As our case convincingly shows, *guanxi* might well play a key role in shaping actors' behaviours and decisions in collaborative work on energy projects. The addition of a focus on the 'play of the game' to the IAD framework, as we found, can bring to light informal or contextual variables in collaborative practices.

Conclusions: embracing an area-based approach for Chinese energy transition

This PhD research highlights the value of an area-specific and associated decentralized approach to energy transition that emphasizes integration of policy and collaboration of actors and institutions into Chinese centralized-oriented energy governance. This study argues how an area-specific approach helps to identify and boost energy practices, which take local contexts, local actors and local responsibilities into account. While a degree of decentralization would be necessary, so as to hand over more autonomy to local governments, however, decentralization cannot simply be assumed to work. Rather, there remains to be a key role for national policies to create central support and incentives.

Based on the main findings and the general implications of this research, the following conditions appear to be crucial for integrating area-specific approaches in Chinese energy governance. First, if necessary national support and stimuli is missing, a more decentralized and area-based approach to energy transition risks failure. National support (e.g., financial incentives, policy guidance, and expertise) is a rather important condition to create sufficient levels of local willingness and ability, which can help and motivate local authorities to pursue proactive and integrated energy policies. Therefore, the support and stimuli provided

by central policies and regulations is a crucial precondition for decentralization to result in positive outcomes. In other words, decentralization (or area-specific solutions) should be pursued with the condition of assessing whether national policies have enabled, stimulated and supported local performance.

Second, central support is not only crucial to provide funds or policy guidance, but also to set up effective regulatory frameworks and pursue institutional reform to remove potential barriers for renewables development. For example, reform and innovation in the Chinese electricity power system is needed. This thesis shows the kind of struggles local government face when trying to implement renewable energy policies, due to the institutional constraints in the Chinese electricity sector. Therefore, the central government needs to build up a more effective institutional framework for the energy transition in China.

Third, current energy transition policies (e.g., energy efficiency) in China are still largely relying on conformance-based targets evaluation, which can provoke a 'ticking-of-the-boxes' instead of promoting actual policy performance. If more successful policy outcomes are desired, decision-makers need to embrace more flexibility and adaptiveness in both target setting and evaluation and situation/area specifics. This alternative way of policy evaluation is to focus more on the actual levels of policy performance, which considers local unique circumstances and hence local municipalities are allowed to choose their own strategy with regard to how deal with national policies and regulations.

This PhD research has two main theoretical contributions. The first contribution is the enrichment of the IAD framework for analyzing institutions (Chapter 5). The enriched version of the IAD framework in this thesis has considered the role of context, informal routines, and interactions by adding the 'play of the game' in the analysis of institutions. The added value of this enriched version of IAD is the provision of a more comprehensive and deeper understanding of how actors deal with institutional barriers and opportunities. Specifically, with the enriched IAD, this study could examine the reasons for the mismatch within and between the 'rules of the game' and the 'play of the game'. To illustrate, Chapter 5 discussed how the cultural factor *guanxi* plays a purposeful role in manipulating exchanges in the decision-making process of energy issues. The case of Guangzhou showed that getting a timely grid connection sometimes depends on how close the *guanxi* relationship is between developers and the grid operator; and investors often make use of *guanxi* with grid operators to obtain the information about grid connection capacity before making any investment (Chapter 5). Hence, the analytical approach adopted in this thesis contributes to a richer understanding of institutions by shifting focus away from thinking only in terms of policy objectives and formal regulations, and instead, seeking to understand how social interactions are also influenced by cultural, (inter) organizational and political dynamics in specific institutional contexts.

The second analytical contribution of this thesis is the use of an area-specific perspective for discussing local impacts of national energy transition policies in China. Firstly, the

area-specific perspective can help understand how national policies impact on local actions and policies related to energy transition. For instance, as Chapters 2 and 3 have shown, an area-specific approach interprets the response of local authorities to the Chinese national policy strategies for the energy transition as influenced by local (geographic and socio-economic) conditions. Hence, an area-specific perspective helps to better ascertain which challenges and opportunities local authorities face while implementing national energy policies. Secondly, an area-specific perspective can help clarify how the interrelatedness between energy systems and their spatial/institutional contexts in practice has been translated into local policies. Chapters 4 and 5 have demonstrated how interrelatedness is more than just respecting and adapting to the physical environment; it is also about how various governmental and non-governmental actors are engaged in local energy actions, specifically, their work on integrated and collaborative energy policies or practices. Hence, an area-specific perspective sets the stage for showing how integrated energy policies (Chapter 4) and collaborative energy practices (Chapter 5) not only relate to local institutional structures but are also made manifest in, and depend on, a geographical setting.

SAMENVATTING

Klimaatverandering is een steeds urgentere wereldwijde crisis, die grotendeels te wijten is aan de uitstoot van broeikasgassen als gevolg van menselijk handelen. De energie-transitie één van de belangrijkste kwesties die dringend aandacht nodig heeft als mensen de effecten van klimaatverandering willen verzachten. Bij de energie-transitie gaat het vooral om de verschuiving van een op fossiele brandstoffen gebaseerd energiesysteem naar een duurzamer en op hernieuwbare energiebronnen gebaseerd energiesysteem. Steden worden beschouwd als cruciale plekken om de energietransitie aan te pakken. Dit proefschrift onderzoekt specifiek stedelijk China, waarbij China misschien wel een van de belangrijkste landen is op het gebied van wereldwijde klimaatactie.

De energietransitie is een zeer complex, dynamisch en multidimensionaal proces waarbij een veelheid aan actoren en netwerken betrokken zijn. Deze complexiteit komt ook tot uiting in de onderliggende processen en praktijken die worden ingezet in de energietransitie. Deze variëren in hun ruimtelijke benadering door verschillende lokale omstandigheden. Het is om deze reden dat de energietransitie voornamelijk leunt op het samenspel van technische, sociale en institutionele innovaties in een geografische omgeving. Er is behoefte aan een specifieke samenstelling van innovaties die in ruimte en tijd variëren. Het beheren van zo'n complexe en onderling samenhangende beleidskwestie, die ook ruimtelijk gevoelig is, vereist een passend institutioneel ontwerp en bijbehorende planningsbenaderingen.

Dit proefschrift behandelt twee belangrijke en voortdurende verschuivingen in de governance van de energietransitie: 1) een verschuiving van een centrale overheid naar een terugtrekkende overheid, en 2) een toenemende decentralisatie en het gebruik van gebied specifieke benaderingen.

Ten eerste is er een erkenning dat vertrouwen op een top-down overheid gebaseerde benadering en de bijbehorende 'command-and-control' stijl van werken onverenigbaar is met het oplossen van complexe problemen. Als reactie hierop ondergaat de organisatie en uitoefening van macht en gezag belangrijke veranderingen. Dit houdt in een vloeiendere verdeling van macht en gezag, zowel tussen overheidsniveaus als tussen overheden en niet-gouvernementele actoren. Ten tweede is er het besef dat decentralisatie een weg is om

de bestuurscapaciteit te vergroten door een gebied specifieke benadering te ontwikkelen die samenwerkende en concurrerende belanghebbenden effectief kan samenbrengen in een lokaal gegrond bestuur netwerk. Met name het opnemen van meer gedecentraliseerde en gebied specifieke benaderingen voor de governance van de energietransitie wordt cruciaal geacht. Het stelt relevante belanghebbenden immers in staat invloed uit te oefenen op de complexe vraagstukken waar zij op hun eigen terrein mee te maken hebben. Dit proefschrift is vooral geïnteresseerd in hoe deze beide mogelijke veranderingen in energiebeheer kunnen uitwerken binnen het Chinese politieke top-down systeem.

Het hedendaagse politieke systeem van China blijft tot op de dag van vandaag sterk gebaseerd op planning van bovenaf, het ontwikkelen van blauwdrukken en het vertrouwen op een command-and-control benadering voor de uitvoering van het beleid. In dit gecentraliseerde bestuurssysteem moeten Chinese lokale autoriteiten voldoen aan sectorale beleidsdoelstellingen die zijn ontwikkeld door de nationale overheid. In zijn huidige ontwerp zal het Chinese beleidskader waarschijnlijk uitdagingen creëren voor lokale autoriteiten die proberen om mogelijk onverenigbare of zelfs tegenstrijdige beleidsambities op lokale stedelijke schaal te implementeren. Lokale overheden moeten immers verplichte sectorale doelstellingen bereiken die zijn vastgesteld door hogere overheidsniveaus (bijvoorbeeld energie-efficiëntie) en tegelijkertijd andere lokale of nationaal opgelegde prioriteiten (bijvoorbeeld economische groei, werkgelegenheid, transport) in evenwicht houden en aanpakken. Gezien de potentiële uitdagingen die met een dergelijk evenwicht gepaard gaan, is het overkoepelende doel van dit onderzoek om het begrip te vergroten van hoe lokaal energiebeheer en de beleidsresultaten worden gevormd binnen het Chinese gecentraliseerde bestuurssysteem.

Onderzoeksopzet

De onderzoeksdoelstelling is vertaald in de volgende onderzoeksvraag:

Hoe wordt lokaal energiebeheer in China gevormd en ontwikkeld, met het oog op de nationale beleidspogingen en strategieën, bij het nastreven van de energietransitie? En wat zijn de beperkingen en kansen voor het nastreven van gebied specifieke benaderingen van energiebeheer in Chinese stedelijke gebieden?

Bij het beantwoorden van de hoofdvraag maakt dit onderzoek gebruik van twee analytische lenzen voor het bestuderen van het institutionele ontwerp van Chinees stedelijk energiebeheer. De eerste lens is die van de beleidsimplementatie, met een focus op de invloed van het nationale energiebeleid op het lokale energiebeheer. De tweede lens is die van geïntegreerde en samenwerkingsstrategieën op lokaal niveau, met een focus op sector overschrijdend werken binnen overheden en tussen overheden en andere maatschappelijke belanghebbenden.

Deze twee analytische lenzen zullen worden gebruikt in de volgende deelvragen die dit proefschrift structureren:

1. **Top-down beleidskader**
   Hoe werkt het Chinese top-down beleidskader voor energie-efficiëntie wanneer toegepast onder verschillende lokale omstandigheden?

2. **Gedecentraliseerd beleidsexperiment**
   Wat zijn de belangrijkste beperkingen waarmee de Chinese lokale autoriteiten worden geconfronteerd met betrekking tot de ontwikkeling en implementatie van lokaal energiebeleid, en hoe beïnvloeden deze beperkingen hun bereidheid en vermogen om dit te doen?

3. **Beleidsintegratie (binnen overheidssectoren)**
   Hoe wordt beleidsintegratie op het gebied van energietransitie nagestreefd in stedelijk China, en hoe maakt het Chinese gecentraliseerde bestuur plaats voor, of beperkt het, lokaal geïntegreerd energiebeleid?

4. **Stakeholdersamenwerking (overheid en niet-gouvernementele actoren)**
   Hoe worden lokale collaboratieve energiepraktijken gevormd door bestaande institutionele regels en voorschriften; hoe worden de rollen van actoren gedefinieerd in het Chinese energiebeheer? Wat zijn de belemmeringen en kansen voor samenwerking met meerdere belanghebbenden?

Deze studie gebruikt een kwalitatieve onderzoeksstrategie, die ten doel heeft de gevolgen van nationaal en lokaal Chinees energiebeleid op lokale schaal in China te onderzoeken. Het doel van het gebruik van case studies is om diepgaand inzicht te krijgen in hoe lokale overheden zelf energietransitie beleid en praktijken ontwikkelen en nastreven, en welke soorten problemen en kansen zich voordoen in het huidige energiebeheersysteem op lokale schaal. Dit proefschrift heeft in totaal acht gevarieerde case studies geselecteerd, die respectievelijk zijn onderzocht met als doel elke vraag in verschillende stappen te beantwoorden en als afzonderlijke hoofdstukken worden gepresenteerd (Hoofdstuk 2 tot 5).

De methoden die in dit onderzoek worden gebruikt, bestaan voornamelijk uit diepte interviews en de analyse van beleidsdocumenten. Tussen november 2015 en 2019 zijn 90 interviews gehouden met belanghebbenden in acht geselecteerde steden waaronder in Beijing (met vertegenwoordigers van de nationale overheid en nationale wetenschappelijke organisaties die betrokken waren bij de beleidsuitvoering, of meer in het algemeen bij de besluitvorming voor de Chinese energietransitie). De interviews zijn op een semigestructureerde manier afgenomen. Alle interviews zijn opgenomen en de gemiddelde duur van elk interview was tussen de 45-60 minuten. De analyse van de beleidsdocumenten bestond uit twee verschillende soorten documenten: (1) primaire documenten, zoals beleidsplannen, beleidsdocumenten, beleidsstrategieën, wetgeving en richtlijnen, en

(2) secundaire documenten zoals onderzoeksrapporten, tijdschriftartikelen, kranten en websites. Alle gegevens werden getranscribeerd, gecodeerd en geanalyseerd met behulp van het programma Atlas.ti. De bevindingen zijn gestructureerd langs de vier deelvragen, met verwijzingen naar de specifieke hoofdstukken.

Werkt de top-down beleidsstrategie goed in het Chinese energiebeheer...
Deelvraag 1: Hoe werkt het Chinese top-down beleidskader voor energie-efficiëntie wanneer toegepast op verschillende lokale contexten?

Hoofdstuk 2 introduceert de concepten conformiteit en prestatie in relatie tot beleids-implementatie van energie governance en onderzoekt hoe het Chinese top-down en conformiteit georiënteerde systeem de beleidsimplementatie met betrekking tot de energie-transitie beïnvloedt. Het identificeert hoe het beleidsontwerp van het stellen en evalueren van doelen zowel de implementatie van beleid en acties op het gebied van energie-efficiëntie op lokale stedelijke schaal beïnvloedt en stimuleert. Dit hoofdstuk is gebaseerd op empirische inzichten uit vier case studies met verschillende stedelijke karakteristieke: Hohhot, Lanzhou, Yangzhou en Chengdu.

Dit onderzoek toont aan dat het stellen van doelen van bovenaf in het Chinese nationale energiebeheer gemakkelijk het risico kan lopen ongevoelig te zijn voor de grote variatie tussen lokale omstandigheden. Met name voor de nationale overheid is het moeilijk om kennis te hebben van lokale verschillen in elke context en hierbij de 'juiste' doelen te stellen. Het niet in acht nemen van verschillende lokale omstandigheden in nationale regelgeving kan een van de oorzaken zijn van lagere beleidsprestaties op lokaal niveau. Hoofdstuk 2 toont belangrijke voorbeelden waar het top-down beleidskader voor nationale energie-productie en -efficiëntie in China de ontberingen en strijd van specifieke regio's en steden over het hoofd ziet om de toegewezen doelen te halen. Economisch zwakkere steden zoals Lanzhou en Hohhot werden bijvoorbeeld geconfronteerd met onrealistische eisen om niet alleen doelstellingen voor economische groei te combineren met doelstellingen voor de energietransitie, maar ook om te voldoen aan vergelijkbare doelstellingen als economisch sterkere steden als Chengdu en Yangzhou. Deze doelstellingen in Lanzhou en Hohhot zorgden dus voor een ernstig conflict met alternatieve beleidsprioriteiten waaraan ook lokale overheden moeten voldoen, met name de groei van het BBP en de werkgelegenheid. Een dergelijk conflict leidde uiteindelijk tot *last-minute* improvisatie tijdens officiële inspecties vanuit de centrale overheid in deze steden, wat resulteerde in optimistischere evaluatie-resultaten dan gerechtvaardigd zou zijn op basis van de werkelijke lokale prestaties. De relatief algemene benadering van het stellen van doelen was onvoldoende aangepast om voldoende stimulansen te bieden in meer geavanceerde steden; in bijvoorbeeld Yangzhou en Chengdu bewogen de prikkels hen nauwelijks om meer te doen dan dat er al gebeurde.

Een andere belangrijke bevinding van Hoofdstuk 2 is dat zelfs wanneer men vertrouwt op een top-down beleidsinstelling, de verschillende manieren om de uitvoering van beleid te evalueren een groot verschil kunnen maken. Conformiteitsgerichte beleidsevaluatie, zoals

onze cases illustreren, kan het 'afvinken van vakjes' uitlokken in plaats van de daadwerkelijke prestaties echt te bevorderen. Daarbij wordt het vasthouden aan de cijfers zelf belangrijker gevonden dan daadwerkelijke investeringen, ruimtelijke effecten en projecten, aangezien aan cijfers een hogere waarde wordt gekoppeld. Daarom kan een sterk op conformiteit gebaseerde governance-aanpak een oppervlakkig verhaal vertellen en niet de werkelijke niveaus van beleidsprestaties weergeven. In het hoofdstuk wordt daarom gepleit voor een meer prestatiegerichte benadering en meer flexibiliteit in zowel het stellen van doelen als het evaluatieschema bij de ontwikkeling van een nationaal beleidskader om de effectiviteit bij het bereiken van energie-efficiëntiedoelen te vergroten.

… Werkt decentralisatie zoals we verwachtten in China?
Deelvraag 2: Wat zijn de belangrijkste beperkingen waarmee Chinese lokale autoriteiten worden geconfronteerd met betrekking tot de ontwikkeling en implementatie van lokaal energiebeleid en hoe beïnvloedt dit hun bereidheid en vermogen om dit te doen?

In Hoofdstuk 3 geeft wetenschappelijk onderzoek aan dat gebied specifieke perspectieven en gerelateerde gedecentraliseerd bestuur essentieel kunnen zijn als aanvulling op, of ter vervanging van, traditionele gecentraliseerde planningsmethoden bij het nastreven van energietransitie in de lokale sfeer. Evenzo heeft de Chinese nationale overheid projecten geïnitieerd die erop gericht zijn meer lokale experimenten op gang te brengen in overeenstemming met het idee van gebiedsgerichte benaderingen. In dit hoofdstuk wordt onderzocht of Chinese lokale overheden de bereidheid en het vermogen hebben om gedecentraliseerd beleid en taken uit te voeren en de gewenste gebiedsgerichte aanpak van energietransitie te ontwikkelen. Vervolgens zoomt het in op vier case steden (Yangzhou, Nanjing, Xi'an, en Dunhuang) via een nationaal proefprogramma, 'New Energy Demonstration City' (NEDC), en laat het zien hoe de steden slechts een beperkte bereidheid en bekwaamheid hebben om hun taken met betrekking tot de energietransitie ten uitvoer te brengen. In vergelijking met andere lokale prioriteiten worden lokale prestaties beperkt door onvoldoende lokale technische en managementcapaciteiten en een mogelijk zwak profiel van hernieuwbare energie in vergelijking met (economische) ontwikkelingsgerichte ambities. Bovendien hebben lokale prestaties een beperkte invloed op de uitdagingen met betrekking tot de energietransitie, aangezien veel kwesties buiten de lokale invloedssfeer vallen.

Hoofdstuk 3 bevestigt dat de voordelen van een overwegend gedecentraliseerde governance-aanpak in de vorm van lokale oplossingen, investeringen en gebied specifieke plannen niet zomaar lokaal kunnen worden gerealiseerd. Onvoldoende lokale bereidheid en capaciteit ondermijnen de lokale prestaties en creëren daarmee risico's voor een succesvolle strategie om decentrale en gebiedsgerichte benaderingen in de energietransitie in China te bevorderen. De bevindingen suggereren met name dat we een veel genuanceerder begrip nodig hebben van hoe centrale overheden en top-down beleid in verbinding staan met lokale bottom-up bestuur benaderingen. Dit onderstreept dat de integratie van meer lokale beleidsontwikkeling niet voorbijgaan mag gaan aan de rol van nationaal beleid om lokale autoriteiten en belanghebbenden in staat te stellen en te activeren om een energietransitie

beleid te voeren. Enerzijds kunnen nationale prikkels (bijvoorbeeld financiële middelen of politieke druk) voldoende extrinsieke motivaties creëren om lokale acties bij het nastreven van energietransitie te stimuleren. Anderzijds kan een zekere mate van nationale steun lokale overheden (vooral kleinere steden zoals Dunhuang) helpen met professionele begeleiding, training en expertise, ideeën en ervaring bieden om nieuwe taken beter aan te kunnen. Daarnaast kan de nationale overheid effectieve regelgevende kaders opzetten om energiehervormingen mogelijk te maken waar lokale overheden beperkte invloed op hebben. Een dergelijke energiehervorming kan bijvoorbeeld een hervorming van de Chinese elektriciteitsmarkt zijn om de mogelijkheden voor toegang tot het net te vergroten.

In hoeverre is sector overschrijdend samenwerken zichtbaar tussen overheidssectoren in stedelijk China?
Deelvraag 3: Hoe wordt beleidsintegratie op het gebied van energietransitie nagestreefd in stedelijk China, en hoe zorgt het Chinese nationale bestuur voor ruimte of beperking van lokaal geïntegreerd energiebeleid?

De energietransitie vereist acties die verder gaan dan wat de energiesector alleen kan leveren en daarom vereist het een zekere mate van beleidsintegratie. Met name op lokaal niveau vragen de ruimtelijke en sociaaleconomische omstandigheden om sector overschrijdend werken. Hoofdstuk 4 analyseert de integratie van klimaatbeleid; een beleid dat naar voren is gekomen als een belangrijke strategie om adequaat te kunnen reageren op energie-kwesties die meerdere sectoren raken als een collectieve verantwoordelijkheid. Vervolgens kijkt dit hoofdstuk naar hoe in stedelijk China de integratie van de energie-ambities binnen andere sectoren zich manifesteert op lokaal niveau. Het hoofdstuk richt zich hierbij op twee onderzochte projecten in twee steden, namelijk Chengdu (Low-carbon City Project) en Yangzhou (New Energy Demonstration City Project).

De situaties van Chengdu en Yangzhou laten duidelijk zien dat beleidsintegratie op het gebied van lokale energievraagstukken niet vanzelfsprekend is. Uit Hoofdstuk 4 blijkt dat energieambities verband houden met ander sectoraal beleid op zowel nationaal als lokaal niveau. Echter in de praktijk wordt nauwelijks lokaal initiatief ondernomen om sector overschrijdend beleid te creëren. In plaats daarvan is de integratie sterk afhankelijk van nationale prikkels die zijn ingebed in verschillende beleidssectoren. Dit betekent dat de Chinese nationale overheid bestaand sectoraal beleid inzet om energiedoelstellingen vast te stellen waarmee lokale overheden moeten werken. Beleidsintegratie met deze benadering is dus niet het gevolg van lokale samenwerking tussen sectoren. In plaats daarvan wordt integratie nagestreefd op basis van implementatie van nationale doelstellingen binnen verschillende sectoren of afdelingen. De onderzochte projecten (d.w.z. LCC- en NEDC-projecten) in hoofdstuk 4 werden in beide steden (Chengdu and Yangzhou) ook niet beschouwd als een gezamenlijke verantwoordelijkheid binnen alle relevante sectoren. Ze werden in plaats daarvan omkaderd als geïsoleerde of op zichzelf staande projecten die voor uitvoering uitsluitend onder de verantwoordelijkheid van de plaatselijke energieafdeling vallen.

De belangrijkste reden die in beide gevallen aan het licht is gekomen, is dat de niet-energie sectoren moeten voldoen aan de nationale doelstellingen door middel van sectoraal beleid, ongeacht of deze betrekking hebben op energie of niet. Zij zien dan ook nauwelijks de meerwaarde in om, naast het behalen van deze doelstellingen, ook een integraal energiebeleid te voeren of hieraan bij te dragen. Dus het voldoen aan de doelstellingen van de centrale overheid op het gebied van energie wordt door de meeste departementen of sectoren op lokale schaal al gezien als hun bijdrage aan de uitvoering van het project. Ondanks het feit dat deze projecten door de meesten als essentieel werden beschouwd, ontbrak in beide gevallen een systematisch, holistisch en afdeling overschrijdend plan gebaseerd op wederzijds begrip van elkaars verantwoordelijkheden en belangen.

Top-down implementatie en nationale sectorale prikkels zouden kunnen leiden tot het versterken van de bestaande neiging van departementen om zich te concentreren op hun eigen beleidsagenda en hierbij kunnen ze zelfs barrières opwerpen voor sector overschrijdend werken. Hoofdstuk 4 stelt echter ook vast dat nationaal beleid nog steeds een sleutelrol kan spelen bij het bevorderen van beleidsintegratie in een lokale context. Daarom pleit dit proefschrift voor meer lokale discretie, maar wel in combinatie met nationale steun en prikkels om lokaal geïntegreerd werken mogelijk te maken en te motiveren.

Hoe wordt lokale samenwerking op het gebied van energie gevormd door bestaande institutionele regels in China?
Deelvraag 4: Hoe worden lokale gezamenlijke initiatieven op het gebied van energie gevormd door bestaande institutionele regels en voorschriften; hoe worden de rollen van actoren gedefinieerd in het Chinese energiebeheer? Wat zijn de belemmeringen en kansen voor samenwerking met meerdere belanghebbenden?

De samenwerking rondom de energie transitie is niet beperkt tot wat er gebeurt binnen overheidsorganisaties. Het is duidelijk dat, aangezien de energietransitie ook tal van maatschappelijke activiteiten met zich meebrengt, samenwerking tussen overheden en alternatieve belanghebbenden vereist is. Het nastreven van meer gezamenlijke inspanningen vereist een effectief institutioneel kader dat goed wordt begrepen door betrokken partijen buiten het overheidsdomein. Dit is belangrijk zodat alle belanghebbenden kunnen worden ondersteund en aangezet om samen op te treden. Hoofdstuk 5 analyseert lokale gezamenlijke energie initiatieven in China door gebruik te maken van een verrijkte versie van het 'Institutional Analysis and Development model' (IAD), dat oorspronkelijk werd voorgesteld door Ostrom. In hoofdstuk 5 analyseren we hoe het gedrag van belanghebbenden met betrekking tot Chinese samenwerking op het gebied van energie wordt gevormd en gedefinieerd door formele instellingen (via de 'spelregels'). Daarnaast kijken we naar hoe contextuele praktijken, informele routines en interacties het gedrag en de acties van actoren vormen (het 'spel van het spel'). Hierbij wordt specifiek gekeken naar het gedecentraliseerde fotovoltaïsche (PV) energieopwekkingsproject in Guangzhou. Dit project kan als een voorbeeld worden gezien voor de uitdagingen rondom het nastreven van samenwer-

kingspraktijken in een grote en voorloperstad op het gebied van energietransitie in China. Wat hierbij van belang is, is om te beoordelen hoe dergelijk samenwerken wordt ervaren en hoe het zich heeft ontwikkeld. Hierbij worden de perspectieven van zowel de kant van de overheid als van andere belanghebbenden belicht.

Het nastreven van een succesvolle samenwerking tussen belanghebbenden is niet zo eenvoudig. Vooral niet binnen een sterk top-down en regelgevend beleidskader zoals in China. We identificeerden verschillende belangrijke problemen in Guangzhou die verband houden met de structuur van het Chinese energiebeheer en die zich waarschijnlijk ook in andere Chinese steden zullen voordoen. We hebben met name enkele belangrijke gevolgen van machtsongelijkheid tussen belanghebbenden geïdentificeerd. We hebben vastgesteld dat de netbeheerders een monopolie positie innemen bij de ontwikkeling van het decentrale PV-project. Machtsongelijkheid resulteerde hierdoor in een aantal problemen, zoals financiële problemen, informatiedoorzichtigheid en gebrek aan toezicht. Deze problemen vormden een belangrijke beperking voor lokaal beleid dat voortbouwt op geïntegreerde strategieën en samenwerkingsbenaderingen. In hoofdstuk 5 ontdekten we ook dat 'guanxi', een belangrijke informele praktijk en culturele traditie die vaak wordt waargenomen in de Chinese zakenmaatschappij, niet gemakkelijk kan worden vastgelegd in het oorspronkelijke IAD-model. Zoals onze casus overtuigend aantoont, zou 'guanxi' wel eens een sleutelrol kunnen spelen bij het vormgeven van het gedrag en de beslissingen van actoren bij de samenwerking aan energieprojecten. Hieruit blijkt dat een toevoeging van een focus op het 'spel van het spel' aan het IAD model, informele en/of contextuele variabelen in samenwerkingspraktijken aan het licht kan brengen.

Conclusies: het omarmen van een gebiedsgerichte aanpak voor de Chinese energietransitie

Dit promotieonderzoek benadrukt de waarde van een gebied specifieke en bijbehorende decentrale benadering van energietransitie die de nadruk legt op integratie van beleid en samenwerking van actoren en instellingen in de Chinese centraal georiënteerde energie governance. In dit onderzoek wordt beargumenteerd hoe een gebiedsgerichte aanpak helpt bij het identificeren en stimuleren van energiepraktijken, waarbij rekening wordt gehouden met lokale contexten, lokale actoren en lokale verantwoordelijkheden. Hoewel een zekere mate van decentralisatie nodig zou zijn om meer autonomie aan lokale overheden over te dragen, kan echter niet zomaar worden aangenomen dat decentralisatie werkt. Er blijft veeleer een sleutelrol weggelegd voor nationaal beleid om centrale steun en stimulansen te creëren.

Op basis van de belangrijkste bevindingen en de algemene uitkomsten van dit onderzoek, lijken de volgende voorwaarden cruciaal voor het integreren van gebied specifieke benaderingen in de Chinese energie governance. Ten eerste, wanneer landelijk draagvlak en prikkels ontbreken, dreigt de decentrale en gebiedsgerichte aanpak van de energietransitie te mislukken. Nationale steun (bijvoorbeeld financiële prikkels, beleidsbegeleiding en

expertise) is een vrij belangrijke voorwaarde om voldoende lokale bereidheid en bekwaamheid te creëren, die lokale autoriteiten kunnen helpen en motiveren om een proactief en geïntegreerd energiebeleid te voeren. Daarom zijn de ondersteuning en de prikkels die door centraal beleid en regelgeving worden geboden een cruciale voorwaarde voor decentralisatie om tot positieve resultaten te leiden. Met andere woorden, decentralisatie (of gebiedsgerichte oplossingen) moet worden nagestreefd met als voorwaarde dat wordt beoordeeld of nationaal beleid lokale prestaties mogelijk maakt, stimuleert en ondersteund.

Ten tweede is centrale ondersteuning niet alleen cruciaal om fondsen of beleidsrichtlijnen te verstrekken, maar ook om effectieve regelgevingskaders op te zetten en institutionele hervormingen door te voeren. Dit is belangrijk om de mogelijke belemmeringen voor de ontwikkeling van hernieuwbare energiebronnen weg te nemen. Er is bijvoorbeeld hervorming en innovatie in het Chinese elektriciteitssysteem nodig. Dit proefschrift laat zien met welke problemen de lokale overheid wordt geconfronteerd bij het implementeren van beleid voor hernieuwbare energie, vanwege de institutionele beperkingen in de Chinese elektriciteitssector. Daarom moet de centrale overheid een effectiever institutioneel kader opbouwen voor de energietransitie in China.

Ten derde berust het huidige energietransitie beleid (bijvoorbeeld energie-efficiëntie) in China nog steeds grotendeels op conformiteit-gebaseerde evaluatie van doelen, die een ‘afvinken van vakjes’ kunnen uitlokken in plaats van daadwerkelijke beleidsprestaties te bevorderen. Als meer succesvolle beleidsresultaten gewenst zijn, moeten besluitvormers meer flexibiliteit en aanpassingsvermogen omarmen, zowel bij het stellen van doelen als bij de evaluatie van specifieke situaties/gebieden. Deze alternatieve manier van beleids-e-valuatie dient om meer te focussen op de werkelijke niveaus van beleidsprestaties, waarbij rekening wordt gehouden met lokale unieke omstandigheden. Op deze manier krijgen lokale gemeenten de ruimte hun eigen strategie kiezen met betrekking tot hoe om te gaan met nationaal beleid en regelgeving.

Dit doctoraatsonderzoek heeft twee belangrijke theoretische bijdragen. De eerste bijdrage is de verrijking van het IAD-raamwerk met betrekking tot het analyseren van overheidsinstellingen (hoofdstuk 5). Deze verrijkte versie van het IAD-raamwerk houdt rekening met de rol van context, informele routines en interacties door het ‘spel van het spel’ toe te voegen aan de analyse van instituties. De toegevoegde waarde hiervan is dat het inzicht brengt in een meer omvattend en dieper begrip van hoe actoren omgaan met institutionele barrières en kansen. Concreet zou dit onderzoek, met het verrijkte IAD model, de oorzaken van de mismatch binnen en tussen de ‘spelregels’ en het ‘spel van het spel’ kunnen onderzoeken. Ter illustratie werd in Hoofdstuk 5 besproken hoe de culturele factor ‘guanxi’ een belangrijke rol speelt in het manipuleren van (informatie) uitwisseling in het besluitvormingsproces rondom energiekwesties. Het geval van Guangzhou toonde aan dat het verkrijgen van een tijdige netaansluiting soms afhangt van hoe hecht de guanxi-relatie is tussen de ontwikkelaars en de netbeheerder. Daarnaast maken investeerders vaak gebruik van guanxi bij netbeheerders om de informatie over netaansluitingscapaciteit te verkrijgen alvorens te

investeren (hoofdstuk 5). Dus, de analytische benadering die in dit proefschrift is toegepast, draagt bij aan een rijker begrip van instituties door de focus te verleggen van het denken in termen van beleidsdoelstellingen en formele regelgeving, naar proberen te begrijpen hoe sociale interacties worden beïnvloed door culturele, (inter) organisatorische en politieke dynamieken in specifieke institutionele contexten.

De tweede analytische bijdrage van dit proefschrift is het gebruik van een gebied specifiek perspectief om de lokale effecten van nationaal energietransitie beleid in China te onderzoeken. Ten eerste kan het gebied specifieke perspectief helpen begrijpen hoe nationaal beleid van invloed is op lokaal beleid en initiatieven met betrekking tot energie-transitie. Zoals hoofdstuk 2 en 3 hebben aangetoond, interpreteert een gebied specifieke benadering de reactie van lokale autoriteiten op de Chinese nationale beleidsstrategieën voor de energietransitie. Een gebiedsgericht perspectief helpt dus om beter vast te stellen voor welke uitdagingen en kansen lokale overheden staan bij de uitvoering van het nationale energiebeleid. Ten tweede kan een gebiedsgericht perspectief helpen om te verduidelijken hoe de verwevenheid tussen energiesystemen en hun ruimtelijke/institutionele context in de praktijk is vertaald naar lokaal beleid. Hoofdstukken 4 en 5 hebben laten zien dat verwevenheid meer is dan alleen respect voor en aanpassing aan de fysieke omgeving; het gaat ook over hoe verschillende gouvernementele en niet-gouvernementele partijen betrokken zijn bij lokale energie initiatieven, met name hun bijdrage aan geïntegreerd energiebeleid. Een gebied specifiek perspectief vormt dus de basis om te laten zien hoe geïntegreerd energiebeleid (hoofdstuk 4) en samenwerking op het gebied van energie initiatieven (hoofdstuk 5) niet alleen verband houden met lokale institutionele structuren, maar ook tot uiting komen in, en afhankelijk zijn van, een geografische omgeving.

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ABBREVIATION

ADB	Asian Development Bank
CSG	China Southern Power Grid
EIA	Energy Information Administration
GDGC	Guangzhou Development Group Corporation
HCDJS	Housing and Construction Department of Jiangsu Province
IEA	International Energy Agency
LCC	Low Carbon City
MOHURD	Ministry of Housing and Urban-rural Development
MOT	Ministry of Transport
MOF	Ministry of Finance
NEDC	New Energy Demonstration City
NEB	National Energy Bureau
NDRC	National Development and Reform Commission
NEA	National Energy Administration
NPC	National People's Congress of China
PV	Photovoltaic
SGCC	State Grid Corporation of China
UNFCCC	United Nations Framework Convention on Climate Change
UN	United Nations
WMO	World Meteorological Organization

1

Planning for energy transition in urban China

1.1 Background and motivation

Global climate crisis and energy transition

The sky was still quite dark at nine in the morning; normally the sun would have been shining long ago. The temperature, on the other hand, was above 40 degrees Celsius. A strong and uncomfortable smell of smog filled the air. Approaching fires had cut off many landway transportation routes, and therefore local residents and tourists had to escape to the coast, waiting for rescue. The above mentioned is not the plot of a doomsday film. Instead, it describes exactly what happened in southern Victoria, Australia on the 31st of December 2019. At that time, Australia was experiencing one of its worst bushfires on record, and 2019 set the new benchmark as the driest and hottest year since 1910.

According to CNN news, by early January 2020, 27 people had died in Australia, and in the state of New South Wales (NSW) alone, more than 2,000 homes were destroyed. In total, more than 7.3 million hectares have burned across Australia's six states, inclusive of an area larger than the countries of Belgium and Denmark combined. All this destruction has been exacerbated by persistent heat and drought, and many scientists have pointed to climate change as a key factor making this extreme weather. But while the fires in Australia have explicitly caught the attention of the international community, extreme weather related to climate change is also affecting the country this thesis focusses on: China.

According to Xinhua, the state news agency, China has been experiencing an unusually intense flooding season in 2020, with rainstorm alerts issued for 26 consecutive days during the month of June. Weeks of torrential rain and heavy flooding in southern China have affected 14 million people and caused an estimated economic loss of around US$ 3.8 billion (South China Morning Post, 2020). The Ministry of Emergency Management has reported that 744,000 people across 26 provinces and cities have been displaced, with 81 missing or dead, and more than 10,000 houses have collapsed… Climate change is increasingly hard to ignore.

Climate change is indeed a global crisis. The impacts of climate change are now occurring and are faster than previously predicted (Sippel et al., 2020), including sea level rise, ice loss, and intense rains as witnessed in China, in addition to more intense heat waves, as experienced in Australia. According to the World Meteorological Organization (WMO), these impacts on the environment have increased significantly during 2015-2019, with this period set to be the warmest five years on record; furthermore, extreme weather events have hit areas with high population density more often (WMO, 2019). Scientists are quite certain that global temperatures will continue to rise for generations to come, largely due to greenhouse gases (GHG) that have been, and continue to be, emitted into the atmosphere as a result of human activity. One of the dominant forces triggering GHG emissions is the burning of

fossil fuels to fulfill energy needs (Ripple et al., 2019). Energy generation is therefore among the prime issues calling for urgent attention if humans are to mitigate the effects of climate change.

For centuries, rapid urbanisation and industrialisation have led to the increased consumption of fossil fuels. It is estimated that cities worldwide use 75% of the world's energy and contribute to 70-80% of global GHG emissions (Satterthwaite, 2008). Since 2007, more than half of the world's population lives in cities, and current predictions say that, by 2050, the share of people living in urban areas is expected to rise to nearly three-fourth (UN, 2018). This trend will impose a larger threat to the global environment if continuous urban growth takes place without dedicated human actions towards climate change mitigation. Therefore, reducing GHG emissions has been put firmly on the global political agenda. In 2013 already 192 countries had ratified the Kyoto Protocol and committed to binding targets to reduce GHG emissions by at least 18% against 1990 levels over the period 2013 to 2020 (UNFCCC, 2013, 2015). Meanwhile, cities are considered to be the vital battlefields for addressing carbon emissions reduction, which includes lowering demand for energy through lifestyle changes, producing and using energy more efficiently (get more from less), and supplying energy drawn from non-fossil sources (Erickson et al., 2013; Lee and Erickson, 2017; Fuhr et al., 2018).

Each of these carbon reduction options urges for a fundamental change in our energy system, and is referred to as 'energy transition' (Rotmans et al., 2001). Energy transition mainly involves the shift from a fossil fuel-based energy system towards a more sustainable energy system (Droege, 2011; Gawel et al., 2019). Such a sustainable energy system is characterised by the responsible use of renewable energy sources and efficient energy use, and includes a wide range of novel technologies and applications; e.g., the electric car, smart grids and increased consumption of solar and wind power. Energy transition is understood to be a complex, non-linear and long-term unpredictable process (De Roo, 2018), comprising comprehensive socio-technical regime changes, the involvement of multi-faceted stakeholders across various spatial and administrative scales, and taking place through developmental phases, each involving various activities (Loorbach, 2007; Verbong and Loorbach, 2012; Bekebrede et al., 2018).

There are several noteworthy challenges in the process of energy transition, and this research focuses on the following two. Firstly, energy transition is not a simple issue involving mere changes of technology. For energy transition to take place, modifications to the economy, rules, values, organisations, policies, and behaviour are needed; in other words, it involves a profound shift in the ways society operates (Kemp, 2011). To illustrate, existing energy infrastructures normally have a long lifetime; they are based on enormous 'sunk' investments and are managed by powerful actors within the energy industry. Rapid changes of policies and the use of new energy infrastructures can therefore be financially and economically cumbersome and disputed (Andrews-Speed, 2012). Moreover, when shifting to a new energy regime, it is also difficult to rapidly restructure the relationships between existing actors and emerging actors. For example, in a renewables-based energy system, electricity is not

necessarily generated from centralised and large production sites (e.g., coal-fired or nuclear-powered plants), but rather is supplied from local distribution networks and even by small market parties, civil society groups, and households (i.e., electricity production is closer to the consumers) (Adil and Ko, 2016). New actors constantly emerge in this renewables-based energy system to generate electricity or participate in selling services in the energy market; these include project developers, new energy companies, prosumers (persons who both produce and consume a product), and technology providers, among others (Tuballa and Abundo, 2016). The actions and interests of emerging actors might well conflict with existing actors in terms of market interests and values. Incumbent energy companies that benefit from existing structures and functions of the energy market can resist changes, especially if these changes are radical and ask for rapid responses (Mori, 2018). On top of that, individuals, companies, households and communities have their own preferences and values regarding the current energy system, and could be risk-averse and thus reluctant to accept major changes (Lehtonen and Kern, 2009). Altogether, the energy system is "a complex web of interrelated actors and networks, both in a physical, economic, social and institutional sense. Apart from limitations to fully oversee and grasp such a complex web, ownership and power are fragmented, limiting the capacity of any actor to alter the energy system" (De Boer and Zuidema, 2015, p. 1).

Next to societal challenges are the spatial implications of energy transition, which constitute another major challenge. Unlike a traditional fossil-fuel based energy system, renewables are not predominantly under the ground. Renewables-based infrastructures such as solar panels, wind turbines, hydropower stations, and biomass production are above the surface and are highly visible. Furthermore, due to its high energy density, the burning of fossil fuels only requires modest sized installations with a limited spatial impact. Whereas generating energy based on renewable sources requires vast areas for capturing sufficient energy from the sun and wind; i.e., the energy density is much lower (Smil, 2010). Integrating renewables-based energy infrastructure into landscapes will therefore not go unnoticed, especially in densely populated areas such as urban regions (Zuidema and De Boer, 2017). The amount of space needed, combined with its visibility, imply that renewable infrastructures need serious area-specific planning. This area-specific planning has to seek a balance between local opportunities of linking specific functions producing and consuming energy, and the risks facing both serious spatial constraints and societal resistance, which are also linked to the so-called NIMBY effect (Not In My Back Yard) (Sijmons and Van Dorst, 2012; Cass and Walker, 2009; Wüstenhagen et al., 2007). Hence, it is necessary to conduct careful planning and management while integrating renewables into the landscape. In addition, different regions face different circumstances such as climate, landscape characteristics, specific settings of interrelated urban structures and functions, policy initiatives, and socio-economic conditions, indicating vastly different potentials for employing alternative renewable energy technologies or efficiency measures. To illustrate, installing wind turbines in Denmark is much more advantageous than installing hydropower due to the country's mostly flat landscape and airy climate. Thus, it is hard to overstate the importance of spatial planning as essential when integrating renewable energy infrastructures into existing landscapes.

Traditional fossil-fuel energy has not been a dominant issue for spatial planners due to its being largely underground with limited spatial claims and also because energy density has made it easy to transport all over the place. Furthermore, in being accustomed to energy plants, electricity wires and the occasional work on grids, there was little debate or conflict regarding these activities. People and spatial planners alike, had taken energy availability and the related infratructures for granted. However, going forward, spatial planners will have to explicitly target the pursuit of a renewables-based and efficient energy system which has a spatial impact in various ways. Therefore, a more successful energy transition requires spatial planning and management where approaches are able to adapt to local circumstances and communities as well as balance stakeholders' varied interests and perceptions (Fuchs and Hinderer, 2014; Wiehe et al., 2020).

Planning is considered to be situated in a socio-institutional system because it functions as an institutional arrangement between government, market and civil groups in a given society (Verma, 2007). "A living institution … is a collection of practices and rules… of appropriate behaviour for actors in specific situations … embedded in structures of …explanatory (and) legitimating … meaning" (Raadschelders, 1998, p. 568). Planning should therefore be well-adapted to the distinct spatial, social and institutional contexts where it is to function; i.e., it needs to be sensitive to specific local circumstances. Planning for energy transition involves a degree of pioneering and searching for appropriate institutional frameworks and approaches for both fields to combine and facilitate the new challenges. This is also a process involving institutional change in a context of existing sectoral policies and a relative lack of experience in combining energy and place. Hence, as some authors have suggested, we ought to study the interface between spatial planning and energy policies and how they interact (Dobravec et al., 2021; Fuchs and Hinderer, 2014; Nadin et al., 2018; Osorio-Aravena et al., 2020; Wiehe et al., 2020). Deliberate consideration of the kind of institutional (re)design needed to pursue energy transition while considering local circumstances is therefore among the essential activities for pushing forward energy transition. It is such a consideration to which this thesis aims to contribute. In this regard, planning research also becomes a matter of institutional investigation (Kim, 2011).

In energy transition literature in general, the role of institutions (or adopting an institutional perspective) towards understanding the transition dynamics and pathways, has not been extensively researched (Fuenfschilling and Truffer, 2014; Andrews-Speed, 2016; Kucharski and Unesaki, 2018; Jehling et al., 2019). We are still in the midst of the search for the appropriate rules and practices; therefore, institutional investigation and design is indeed important (Cajot et al., 2017; Nadin et al., 2018; Camargo and Stoeglehner, 2018). In addition, the interaction between energy transition and spatial planning is under-researched (e.g., Asarpota and Nadin, 2020). Adil and Ko (2016) conclude that there is scant research regarding how new energy technologies evolve together with social responses. Notably, energy is hardly considered in most planning departments, which implies that local and regional approaches to energy planning and related energy governance remain novel (Hoppe and Miedema, 2020; Cajot et al., 2017). Some scholars, for example, Kempenaar

et al., (2020) and Zuidema and De Boer (2017) suggest that strategic and holistic thinking must be included in governance for energy transition in response to our societies' quest for sustainability. This thesis is particularly interested in the integration of efficient and renewables-based energy technologies and infrastructures in the physical and socio-economic environment.

Why does the local scale matter?

In being responsible for 70-80% of the world's GHG emissions, cities are considered crucial in a transition of the worlds' energy system (Monstadt and Wolff, 2015). In addition, academic research clearly suggests a preference for taking the local context (or local physical and socio-economic landscape) into account for the governance of energy transition (e.g., Coenen and Truffer, 2012; Howard et al., 2013; Wiersma and Devine-Wright, 2014). Two main supportive arguments stand out.

First, given that each area has different potentials and constraints, developing renewable energy policies often takes place in close connection with spatial-physical and socio-economic conditions (Howard et al., 2013). To illustrate, in contrast with existing fossil fuel-based energy systems, electricity in a renewables energy system is, to a significant degree, generated through multiple and smaller production sites such as solar PV panels on a rooftop, or a wind turbine in a field close to a village or community (Adil and Ko, 2016). A rooftop photo-voltaic (PV) project generally needs a 20-year investment period and requires a sufficient number of potential participating rooftop owners in a distinct area. However, rooftop owners might be reluctant to rent out their roofs in consideration of aesthetics and spatial problems such as security of roofs (e.g., load bearing and leakage). Perhaps they may not wish to commit to such a long period, or there might be general resistance to a decentralised energy system (i.e., passive consumer turned into active prosumer) by traditional energy suppliers or grid operators who perceive it as disruptive, or even threatening to grid stability. It can be seen that spatial consequences and their related conflicts of interest among stakeholders can hamper an energy policy from being well-implemented in a specific location. Therefore, taking local conditions into account can help understand local needs, constraints, dynamics, and potentials, which may allow energy projects or policies to become less vulnerable to social resistance and implementation failure (De Boer and Zuidema, 2015).

Furthermore, due to the fact that energy issues are strongly embedded in their local contexts, policy developments manifest themselves differently in different places. For example, within China, cities located in the northwest (e.g., Lanzhou or Dunhuang) have a favourable climate for renewable energy generation, but are economically less developed than east coast cities (e.g., Hangzhou or Nanjing). Policy ambitions, financial and administrative challenges, and stakeholder interests in various Chinese regions can therefore be very different. As such, taking local context into account (i.e., bringing decision-making closer to the local level) can support policy makers and planners to better respond to local circumstances and stakeholder

interests (Cajot et al., 2017; Camargo and Stoeglehner, 2018; Dobravec et al., 2021; Fuchs and Hinderer, 2014). Furthermore, it allows political constituents to exert influence over the issues they face in their own areas based on the specific local contexts.

Second, local level practices are considered as important channels for exploring and creating new knowledge, innovative measures, and governance capacity for the future pursuit of energy transition (Van der Schoor and Scholtens, 2015; Hasanov and Zuidema, 2018). Due to the rise of renewables, we have seen increases in the development of local and community energy initiatives by citizens and small entrepreneurs who want to become prosumers or producers themselves (Wiersma and Devine-Wright, 2014). These local bottom-up actions and initiatives allow for, as well as generate, novel solutions and may themselves use their own local networks, resources and strategies to explore increasingly efficient and realistic approaches and projects. Additionally, these bottom-up developments could lead to institutional innovations that support renewables, and could well be more likely to integrate easily into existing area-specific energy policy (De Boer et al., 2018). If energy transition policies are to benefit from such area-specific energy practices, there is a need to embrace local contexts, as they are thriving in the local physical, socio-economic and institutional conditions.

Clearly, the local scale is a key site for experimentally and innovatively creating energy practices and initiatives to develop, in the words of De Boer and Zuidema (2015), what is known as an 'area-based niche'. Such an area-based niche highlights the development of energy practices and policies connected to surrounding spatial contexts. In addition, local energy policies and initiatives can then be better translated into regional or national energy policies and strategies that carry meaning in a local context; i.e., they allow policy implementation in connection with local specific circumstances. Next to (inter)national policy frameworks, incentives and objectives, there is much scope to also pursue distinct area-specific approaches where local authorities are themselves in the lead to find locally suitable options that make sense to those involved. As Sijmons and Van Dorst (2012) state, "space and its sociopolitical arena will be the battlefield where the energy transition will be won or lost" (p. 46).

Why does China matter?

This PhD thesis specifically examines urban China. China is arguably one of the most important countries in terms of global climate action (Schreurs, 2017). Decades of rapid economic growth have led China to be the largest energy consumer and the largest emitter of carbon dioxide worldwide (Zheng et al., 2020). China was considered to be responsible for about 27% of total world CO_2 emissions in 2012 (PBL NEA, 2013). Over the last three decades, China's large manufacturing-based economy has been driven primarily by fossil fuels, and coal still supplies the vast majority (58%) of China's total energy consumption in 2018 (BP, 2019). The Energy Information Administration (EIA) also reports that China surpassed the United States in 2013 as the world's largest net importer

of petroleum and other liquids (EIA, 2014). Next to its massive impact on global CO_2 emissions and hence, climate change, China's dependence on fossil fuels also significantly contributes to heavy air pollution, leading to serious public health impacts (The World Bank, 2018). Faced with both international and domestic pressure to move away from fossil fuel dependence, energy transition has been pushed up the agenda of the Chinese central government.

The Chinese central government has set targets to achieve: (1) a reduction of CO_2 emissions per unit of GDP by 40%-45% relative to 2005 levels by 2020 (State Council, 2009), and (2) an increase in the share of non-fossil fuel energy up to 20% of total energy consumption by 2030 (NDRC, 2016). It could indeed be more challenging, however, for a country like China (compared to other industrialised countries) to promote a transition to a low-carbon society; this is mainly because China's economy continues to expand rapidly, and coal remains dominant in the energy mix for the foreseeable future. Numerous questions have been raised such as, how can China address this challenge? How can China reconstruct the relationship between cutting emissions and maintaining continued economic growth at the same time? What are successful and effective policy strategies to be used in Chinese energy governance? All these factors and specifically, the 'successful and effective policy strategies' question, have triggered my motivation to conduct this research on energy transition in urban China.

1.2 Research objectives

Shift from 'government' to 'governance'

As discussed, energy transition is a highly complex and dynamic multi-dimensional process involving a multitude of actors and networks. This complexity is also reflected in the underlying processes and practices towards energy transition that vary spatially due to different local circumstances. As a number of authors have claimed, energy transition mainly relies on the interplay of technical, social and institutional innovations in a geographical setting (Bridge et al., 2013) and "these particular assemblages vary over space and time" (Faller, 2016, p. 86). Managing such a complex and interrelated policy issue, which is also spatially sensitive, requires suitable institutional frameworks and effective planning approaches. Furthermore, energy has traditionally relied on central government dominated policies, certainly in China. This might not only be challenged by the aforementioned desire to add more area-specific policy approaches, but also resonates with existing changes within the realm of planning and policy-making in general.

For most of the twentieth century, planners were strongly attached to the idea that the world 'is' functional and mechanistic (Rauws, 2015); this perspective presupposed a high degree of certainty over cause and effect relations, and hence were fueled by the idea that most

planning issues could be approached as being fairly straightforward and fixed. Planners in general were thus assumed able to have sufficient knowledge at hand to describe the problems they faced and would be able to predict the outcomes of their planned actions. Fueled by the assumption that control was possible over any planning problems arising, planning was dominated by attempts to identify the most effective and efficient means of solving a predefined problem, i.e., what is generally understood as a technical rational (Faludi, 1973) or functional rational approach (Friedmann, 1987) to planning. Associated with such an approach is a reliance on a centralised command-and-control approach through developing blueprint formats, routine procedures, and fixed targets (De Roo, 2016). Control was not merely assumed to be possible over the planning problem and its context, but also over the entire process of executing policies and plans; i.e., formal government bureaucracies would simply implement the policies and plans already set out. However, reliance on such a top-down '*government*' control approach to solving issues, and its associated command-and-control style of working, became increasingly problematic (Zuidema, 2017). Problems include for example, incoherent policies, coordination deficits between separate policy themes (e.g., Breheny et al., 1985; Friedmann, 1973) and also the central risks of having limited knowledge and understanding of the exact local conditions and stakeholder interests (Zuidema, 2017).

In response, skepticism to this government style of governing emerged as early as the 1960s in the planning debate with reference to experiences in Europe and the US. Skepticism gradually led to the general acceptance that societies are far more complex and fragmented than had been previously assumed, and acceptance of the complexity of many societal issues has led to changes in the process of governing (Hardin et al., 2003; Kooiman, 1993). This change is often called by scholars as a *'shift from government to governance'* (e.g., Jordan et al., 2005; Sørensen, 2006). As a style of governing, *governance* relies on a structure that also includes non-government actors (i.e., private markets and civil society), together with formal governments in governing societies (Kickert, 1997; Rhodes, 2007; Voss et al., 2007).

Therefore, since the 1980s in particular, extensive governance renewal operations in Europe and the US can be observed (Pierre and Peters, 2000). Various models of governance began to coexist, while these changes imply that power and responsibility were shifting from the national state to other interrelated organisations or actors, i.e., upward to supranational bodies, sideways to markets and civil society, or downwards to lower tiers of government (Hysing, 2009). While governance signifies a shift away from a mere dominance of governmental action in the process of governance, within debates on planning also the notion of *communicative rationality* has gained traction (Healey, 1997; Innes, 1995, 1996). Communicative rational approaches highlight the interests, opinions, and perceptions of multiple stakeholders involved in the planning processes (De Roo, 2003; Forester, 1982). Policies, organisations and bureaucracy are thus largely encouraged to be more open and stakeholders more motivated to express their own positions, interests and social values in the decision-making processes. As a result, processes of policy development and decision-making aim not only for the inclusion of a wider set of stakeholders, but also seek to better

balance or combine their various interests and perspectives. While formal governmental policies continue to play an important role in such a process, they are not necessarily dominating them. Rather, the inclusive and ideally integrative nature of these processes implies that governments are merely among the key actors. In this, central government(s) no longer occupy the most important position in the decision-making process. Instead, they govern the societal issues by involving a wide diversity of relevant societal parties and lower levels of government, and by aligning policies with specific circumstances.

Among the key process employed to pursue governance renewal is the shift of power and responsibility away from the central state to lower levels of policies; i.e. decentralisation. This might in part be framed as a fashionable idea, which is not necessarily surrounded by much clarity on its costs and benefits (De Vries, 2000; Prud'homme, 1995). It is also, however, fueled by the argument that such a shift has some important benefits, certainly when it comes to engaging with stakeholders in more communicative settings and coping with interrelated policy issues and their often unique local manifestations (Brinkerhoff and Azfar, 2010; Zuidema, 2011). Among the various means of pursuing governance renewal, decentralisation has received much attention (Faguet, 2014; Grindle and Grindle, 2007).

Decentralisation and area-specific approaches to energy transition

Decentralisation is here understood as "a process, the aim of which is to transfer tasks and power from a higher to a lower echelon in an organisation, whereby the lower echelon both performs the task and assumes responsibility for it" (Elzinga and Hagelstein, 1998, p. 111). Hence, decentralisation calls for a greater involvement of lower levels of government in the process of governing. Rather than dominated by central governments, process of inclusion and integration are pursued in regional or even local arenas. In this, local authorities are considered to be better positioned to collaborate with local stakeholders and civil organisations to produce tailor-made policies based on specific local characteristics (Bardhan, 2002; Pierre and Peters, 2000; Rumbach, 2016; Zuidema and De Roo, 2015).

Arguments in support of decentralisation assume that local governments are better suited to address more interrelated policy issues which are strongly embedded in their local context (e.g., energy issues, as discussed) (De Vries, 2000; Faguet, 2014; Zuidema, 2017). These locally embedded issues are strongly tied with other local interrelated issues and are surrounded by potentially conflicting interests and perceptions. In addition, they often have a time and place-specific manifestation and thus can benefit from a more integrated and holistic policy approach that places value on local contextual conditions. With an integrated approach, energy policies and activities can be balanced and combined with other local policy targets tailored to local circumstances. Such an approach is often associated with 'area-based', 'place-based', 'area-specific', or 'area-oriented' planning (Heeres et al., 2012; Todes et al., 2004; Turok, 2004), which assumes the spatial context to be essential to the understanding of "local needs, conditions, dynamics and potentials, and that includes local

residents and stakeholders in a collaborative planning process" (Cameron et al., 2004, p. 311). It implies that area-specific approaches can be the foundation of communication and cooperation between all professional and non-professional stakeholders. Obviously, decentralisation is a pathway for increasing the governance capacity to develop an 'area-specific' approach that can effectively bring collaborating and competing stakeholders together in a locally-grounded governance network.

Decentralisation can be an important vehicle to allow for the desired area-specific approaches to energy transition. Doing so also implies a relative move away from a reliance on the regulatory capacity of government bureaucracies, centrally issued policy objectives (quantitative targets and standards), and hierarchical control (e.g., Kooiman, 1993; Pierre and Peters, 2000). Such quantitative targets could, for example, involve a specifically required amount of electricity produced by solar and wind energy, the construction size of photo-voltaic (PV) projects, or the spatial arrangement of areas planned to accommodate renewable energy infrastructures. It is exactly in the detailed formation of such targets that central government might have difficulty being sufficiently flexible to both lower its ambitions in response to local complexities; or alternatively, to set targets that are sufficiently ambitious to provide a real push for change. In other words, embracing area-specific solutions might not just be a crucial element in pushing (urban) energy transition forward, but also poses questions regarding how much and what kind of central policy frameworks and incentives are appropriate to support and promote action at a local level.

To sum up, including more decentralised and area-specific approaches for energy transition governance is considered as crucial. After all, it allows relevant stakeholders to exert influence over the complex issues they face in their own areas (Van Bueren et al., 2011). With this shift in governance, this study is particularly interested in how such a change in energy governance can work out within the Chinese top-down political scheme.

Research aim and questions

Although the academic debate on energy transition in China is widely recognised as crucial, research on the Chinese energy policy context has only recently emerged (e.g., Cai and Aoyama, 2018; Han et al., 2018; Yuan et al., 2012; Zhang, 2010). Even more limited are studies addressing local energy governance, whereas consideration of how local spatial contexts shape energy governance and its outcomes is only just emerging in China. Most studies focus on answering the question about "where to go" in the future by exploring paths to building up new low-carbon cities (e.g., De Jong et al., 2013; Dienst et al., 2013; Guan and Barker, 2012; Jakutyte-Walangitang and Page, 2012; Wang et al., 2013; Zhang et al., 2011). Others focus on the question "what to do", by analysing the challenges and opportunities of renewables policies and measures that have been developed in the past decade (e.g., Jiang et al., 2010; Shi, 2009; Zhou et al., 2012), or studying technology applications and innovations (Chen and Xu, 2010; Fischer, 2012; Fisher-Vanden et al., 2006; Ru et al., 2012; Zhou et al., 2012). Few studies, however, approach the interface of (spatial)

planning and energy transition and more specifically, the institutional context in which area-specific approaches to energy transition might unfold in urban China.

Until today, China's political system still remains strongly based on top-down planning, developing blueprints and relying on a command-and-control approach to policy implementation (Logan, 2018). In this centralised governance system, Chinese local authorities have to comply with sectoral policy targets developed by the national government (Hu, 2016). In its current design, the Chinese policy framework is likely to create additional challenges for local authorities who seek to develop area-specific approaches to advance energy transition. Mandatory sectoral targets do not necessarily reflect the desire or even need to balance alternative local priorities and objectives. As a consequence, some local authorities might be pushed to implement policies that have serious or even disruptive implications (e.g., on economic growth, employment, transportation, housing). Alternatively, they might push for solutions that are not the most efficient or sensible given specific local opportunities and potentials. This, in turm, results in a shift of resources away from projects and efforts that could have made a bigger impact.

Given these potential challenges, the overarching aim of this research is to advance our understanding of how local energy governance and its policy outcomes are shaped within the Chinese centralised governance system. In order to fulfill this aim, it is necessary to have a relatively comprehensive institutional understanding of Chinese policy-making and implementation of energy issues, in particular at local scale. This objective can be translated into the main research question as follows:

How is local energy governance in China shaped and developing, given the national policy attempts and strategies in pursuing energy transition? And what are the constraints and opportunities for pursuing area-specific energy governance approaches in Chinese urban areas?

In answering the main research question, this research uses two analytical lenses for studying the institutional design of Chinese urban energy governance. The first lens is the interaction between central policy frameworks and local energy governance; i.e. how local authorities are coping with the existing Chinese top-down policy framework on energy issues, and meanwhile identify key issues local authorities face while doing so. China has recently been experimenting with more decentralised policy approaches at local scale, aiming to boost local energy transition. Exactly how does this decentralisation unfolds in an existing context where formal and informal practices were and are geared to top-down policy implementation, however, remains to be identified. As some scholars warned, the benefits of decentralisation cannot simply be assumed. In the words of Zuidema (2017) and Flynn (2000), the outcome of decentralisation is associated with local willingness and ability to perform decentralised tasks and responsibilities. Given that critical arguments regarding decentralisation do arise, this thesis will then examine how Chinese local authorities are dealing with decentralised energy tasks.

The second lens further pursues the notion that local willingness and ability cannot simply be assumed to exist. Specifically, it means to address the two main components of more decentralised and area-specific practices that give it an added value: integrated policy development and collaborative working at local level, with a focus on cross-sectoral working within governments and between governments and other societal stakeholders. Energy transition cannot be achieved by one single policy sector. Instead, energy transition requires actions beyond what the energy sector can deliver; and it is also in need of a wide range of organisations, business partners, communities and individuals working together and collaborating with each other (e.g., Osorio-Aravena et al., 2020; Dobravec et al., 2021). As such, this thesis will investigate how such a cross-sectoral, integrated and collaborative approach for local energy practices becomes manifest at local scale within the Chinese top-down policy system.

Each of the two lenses offers its own distinct view on researching Chinese energy governance and the possible role of area-specific approaches in supporting such energy governance. Area-specific approaches are seen as potentially crucial for both allowing for more cross-sectoral working and the crossing of boundaries between the public and private spheres. The second analytical lens allows us to investigate both and in doing so, adds to the first analytical lens in not only identifying barriers and opportunities for area-specific working that are external to the local governance arena, but also those that are local in itself. In doing so, it is the ambition to gain a richer perspective on how local authorities navigate the challenge of energy transition in the midst of both external (national) institutional requirements and expectations and the specific local spatial, economic and institutional circumstances that shape opportunities for integrative and collaborative working.

These two analytical lenses will be presented in the following sub-questions structuring the overall study:

1. **Top-down policy framework**
   How does the Chinese top-down policy framework for energy efficiency function when applied under different local circumstances?

2. **Decentralised policy experiment**
   Which are the key constraints that Chinese local authorities face regarding the development and implemention of local energy policies, and how does this affect their willingness and ability to do so?

3. **Policy integration (within governmental sectors)**
   How is policy integration on energy transition pursued in urban China, and how does Chinese centralised governance allow for, or constrain, local integrated energy policies?

4. **Stakeholder collaboration (government and non-government actors)**
   How are local collaborative energy practices shaped by existing institutional rules and

regulations; how are the roles of actors defined in Chinese energy governance? What are the barriers and opportunities to multi-stakeholder collaboration?

This study contributes to strengthening scientific knowledge on pursuing energy transition in urban China through applying an institutional analysis. It specifically shows how current national energy strategies are impacting local energy practices and policy outcomes, and explores the existing institutional constraints and opportunities of the current local energy governance system. The resulting knowledge is especially useful in the (re)development of energy policies and guiding institutional frameworks, both on a national and sub-national level. Hence, it is the ambition with this study to not only support academic knowledge on energy governance in urban China, but also to be instrumental in feeding discussions on policy development in China to further foster such a transition.

The academic novelty of this thesis starts with taking an institutional perspective on local energy transition in a Chinese context. While this is in itself already a contribution to a relatively underdeveloped literature on this topic, it also does more. For one, the focus on the interaction between top-down issued policies and local efforts to develop energy policies is relatively novel in itself. Second, this study contributes by adding an integrated and area-specific planning perspective to existing discourses on energy transition thinking situated within the Chinese planning debate. According to Coenen et al. (2012), transition analyses have neglected the spatial dimension (i.e., where transition takes place) as well as the socio-spatial relations and dynamics within which transitions evolve. Energy transition is spatially sensitive, as different areas might well have to rely on their own institutional arrangements, power relations and governance abilities that will jointly decide the transition dynamics (Dobravec et al., 2021; Fuchs and Hinderer, 2014). This study highlights the close linkages between the energy system and its spatial-physical, socioeconomic and institutional contexts, showing that an area-specific approach may provide an in-depth understanding of how contextual conditions impact on (i.e., enable or constrain) energy practices in a particular place. In addition, an area-specific approach provides an alternative way to view and deal with planning issues, and ascertaining how they are affected by local conditions (Van Bueren, 2009). As such, it might be a useful complement to the dominant planning approaches in China (i.e., top-down, centralised-based).

1.3 Research strategy

This PhD research is empirically grounded on a qualitative case study approach to investigate the impacts of national and local Chinese energy policies at the local scale in China. The aim of using case studies is to gain an in-depth understanding of how local authorities themselves develop and pursue energy transition policies and practices, and which types of problems and opportunities arise in the current Chinese energy governance system at a local scale. "A case study is an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, programme, or system in a real-life context" (Simons, 2009, p. 21). A case study approach can enable researchers to capture concrete, relevant contextual conditions and particular knowledge. However, it is crucial to recognise that China is a large country within which regions are vastly different, and it is hard to generalise about Chinese energy governance on the basis of individual cases. In response, this thesis has studied multiple cases of Chinese cities with the ambition to better explore and acquire a more thorough understanding of not only these distinct cities, but as far as possible for Chinese urban energy governance overall. In this, case selection is vital. Flyvbjerg (2006) argued that "generalisability of case studies can be increased by the strategic selection of cases" (p. 229). How cases are chosen will greatly add to the knowledge and generalisability of a given issue (Ragin and Becker, 1992).

This PhD thesis has deliberately selected eight varied case in total, which are, respectively, researched with the goal of answering each individual research sub-question in different chapters (Table 1.1). Furthermore, for some of the research questions, cases were strategically chosen to allow for more general conclusions. Nevertheless, this thesis aims to generate a *picture* of local energy governance in the context of top-down policies and regulations in China. While such a picture tries to go some way in reflecting the richness of local contexts in China, this thesis essentially has an explorative intention. Rather than targeting generalisation, this thesis allows for the identification of conditions shaping local energy governance in real and in-depth studied environments. As will also be expressed in the following chapters, these conditions do on occasion allow for more generalised remarks, or provide important signposts upon which future research can build. Hence, generalisation is merely considered when possible and sensible, while on other occasions this work stays close to its main intent: to identify conditions such as barriers, opportunities, problems, and thus, develop a clear and fair picture of local energy governance in several different Chinese cities.

Table 1.1 Research structure and case studies of the thesis

Analytical lens	Research questions	Cases	Chapter
1) Policy implementation	How does the Chinese top-down policy framework for energy efficiency function when applied under different local circumstances?	Hohhot, Lanzhou, Yangzhou, Chengdu	Chapter 2
	Which are the key constraints that Chinese local authorities face regarding the development and implemention of local energy policies and how does this affect their willingness and ability to do so?	Dunhuang, Xi'an, Yangzhou, Nanjing	Chapter 3
2) Integrated and collaborative strategies	How is policy integration on energy transition pursued in urban China, and how does Chinese centralised governance allow for, or constrain, local integrated energy policies?	Chengdu, Yangzhou	Chapter 4
	How are local collaborative energy practices shaped by existing institutional rules and regulations; how are the roles of actors defined in Chinese energy governance? What are the barriers and opportunities to multi-stakeholder collaboration?	Guangzhou	Chapter 5

Case selection

All selected case studies are chosen based on two general considerations. First, in answering each subquestion (Chapters 2-5), cases were included that are ambitious in pursuing a sustainable energy system, either by actively implementing energy policies, or participating in national and local energy transition projects. By choosing more ambitious cases, there is a guarantee that significant local efforts in pursuing energy transition do exist. Furthermore, this thesis works under the assumption that there might be clear barriers for developing local energy policies that are area-specific and tailor-made due to the traditional top-down oriented way of working in China. Hence, if barriers exist even in the most ambitious cities, then it is likely that other cities will also struggle with these barriers, which would be a step towards a more general reflection on the situation in China.

Second, the selected cities cover a broad diversity of different urban conditions across the whole of China (e.g., resource distribution, population size and industrial structure). This provides the opportunity to gain insights from a varied set of cases and hence, to uncover different barriers and enablers affecting local energy transition policies (Fig. 1.1). In China, cities from different geographic regions are vastly different in culture, topography,

levels of economic development, distribution of energy resources, and even institutional arrangements, despite the Chinese centralised policy framework. By using this distinction between cities, it is expected that different local policy strategies and administrative choices will emerge that can lead to meaningful energy practices. A general introduction of these selected cases is illustrated below based on their geographic location.

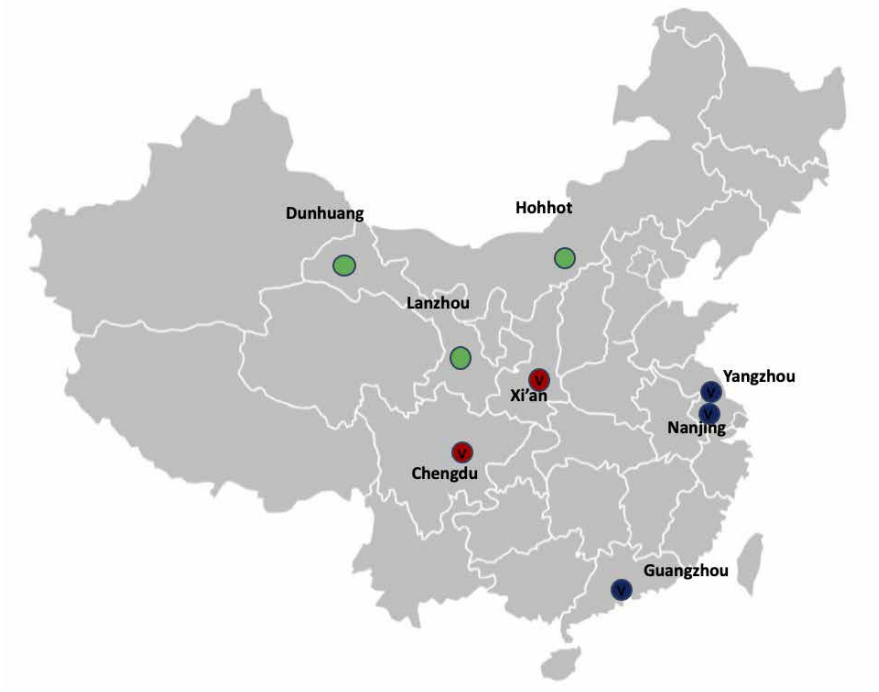


Figure 1.1 Location of the eight case study municipalities (Source: Author)

Northwest cities

Three cities have been selected from the provinces of Gansu (Lanzhou and Dunhuang) and Inner Mongolia (Hohhot city), respectively. Each of these cities lies within an economically less developed area in China. These areas still strongly rely on the traditional heavy industrial economy with high energy demand (e.g., coal, petroleum and gas). In addition, as coal-related fossil fuels are mainly distributed in North and Northwest China, cities in these regions are also responsible for providing electricity and industrial materials for other Chinese areas. For example, over one-third of the annual power supply generated from fossil fuels in Inner Mongolia (where Hohhot is located) is exported to other regions, especially to the economically-developed Chinese east coast.

Nevertheless, these three less developed cities are located in regions with the richest renewable energy resources in China (e.g., solar and wind). For example, Dunhuang is a

rather small city with 'only' 0.18 million inhabitants. However, it is one of the richest areas in China for solar energy, with approximately 3,258 sunshine hours per year and a 75% sunshine percentage.

Eastern cities

Nanjing and Yangzhou are located on the eastern costal region, Jiangsu province, one of the leading provinces in finance, education and technology in China, and has the highest GDP per capita of all Chinese provinces. Both cities have a strong economic development and are dependent on other fossil-rich areas in China for their energy supply. Yangzhou is committed to becoming a livable city and has already shown strong interest and taken action regarding renewable energy initiatives. The third eastern case study selected is Guangzhou, one of China's four major highly developed cities (the other three are Beijing, Shanghai and Shenzhen). Guangzhou is also the largest city and political, economic and cultural centre of southeast China. All three of these eastern cities have strong economies but only moderate energy resources.

Western (and central) cities

Chengdu serves as the capital of Sichuan Province and is the third most populous city in Western China, the other two being Chongqing and Xi'an. Chengdu is now one of the most important economic, financial, commercial, cultural, transportation, and communication centres in Western China. Whereas Xi'an is the capital of Shaanxi Province and maintains an average economic strength within China. The city of Xi'an also functions as an important cultural, industrial and educational centre of the central-northwest region, with facilities for research and development, national security, and space exploration. Both Chengdu and Xi'an are cities with moderate energy resources in China.

Methodology

The methods used in this research mainly comprise policy document analysis and in-depth interviews. Although the main source of primary data for this PhD research is based on in-depth interviews, policy document analysis is the key starting point for a quick scan of the political system and policies on energy transition; moreover, it provides a springboard into the issues and challenges brought to the forefront during the in-depth interviews.

The policy document analysis in this PhD research consists of two different kinds of documents: *(1) primary* documents, including plans, policies, strategies, legislation and guidelines, and *(2) secondary* documents such as research reports, journal articles, newspapers and websites. The analysis of primary documents comes first in order to understand the rules, procedures and measures applied at the national and regional levels (i.e., what is being said on paper), and also allows for a comparison between what

is being said and what is being practiced. Analysis of secondary documents complements the findings from the interviews by providing a more general analysis of certain policies and projects. Secondary documents also help to contextualise findings within the wider discusson on Chinese energy policies.

In-depth interviews offer respondents the opportunity to express their own emotions, perceptions, opinions, and values instead of being guided during the interview through more structured questionnaires. The purpose of the interviews was to understand stakeholders' policy choices and strategies, and to get a better grip on the struggles and possible motivations in the decision-making and implementation process of energy transition policies in urban China. Between November 2015 and 2019, 90 interviews were carried out with stakeholders in eight selected cities, and with representatives from the national government and national scientific organisations who were involved in the policy implementation, or more generally in decision-making for Chinese energy transition. Interviewees include representatives of governmental authorities (national, regional and local), knowledge institutes, media (e.g., journalists) and business interest groups (e.g., energy companies). A full list of anonymised interview respondents is set out in Appendix A. The interviews were conducted in a semi-structured way. The interview guides were designed for the interviews and are also given in Appendix B. All interviews were audio-recorded, and the average duration of each interview was between 45-60 minutes.

Additionally, in Chapters 2 and 3, prior to the in-depth interviews, an explorative focus group session at a workshop in China was conducted for an initial screening. The workshop was organised by *China Energy News* in Guangzhou city, with 40 practitioners coming together from a broad range of regions in China in December 2014. This workshop was particularly helpful for the first and second research objectives of the present thesis, and provides a general overview of local authorities' responses to national energy policy strategies.

All the collected data from the in-depth intervews were fully transcribed and coded using the Atlas.ti computer programme. For the policy document analysis, Atlas.ti was used to code certain excerpts of the text. Further details on the process of data collection (i.e., when, what, where, and with whom) and data analysis (i.e., how) will be provided in each chapter (see Chapters 2-5).

1.4 Structure of the thesis

This PhD thesis is structured across six chapters, with four research questions explored and answered in Chapters 2 to 5 (also Table 1.1).

Sub-question 1: How does the Chinese top-down policy framework for energy efficiency function when applied under different local circumstances?

Chapter 2 introduces the concepts of conformance and performance in relation to policy implementation of energy governance, and investigates how the Chinese top-down and conformance-oriented system impacts policy implementation regarding the energy transition. Specifically, it identifies how policy design of target setting and evaluation is both impacting and driving the implementation of energy efficiency at the local urban scale. This chapter draws on empirical insights from four cases with varied urban conditions: Hohhot, Lanzhou, Yangzhou, and Chengdu. These urban case studies have visualised the problems arising from the top-down energy efficiency framework, and which have inhibited the implementation of centrally issued targets and policies. These barriers have even undermined local performance of pursuing ambitious energy efficiency objectives. The chapter argues for a more performance-oriented approach and increased flexibility in both target setting and the evaluation scheme in the development of a national policy framework so as to enhance effectiveness in reaching energy efficiency targets.

Sub-question 2 : Which are the key constraints that Chinese local authorities face regarding the development and implemention of local energy policies and how does this affect their willingness and ability to do so?

In Chapter 3 the results of the research executed indicate that area-based perspectives and related decentralised governance approaches may be essential in complementing, or partly replacing, traditional centralised planning methods in the pursuit of energy transition in the local realm. Similarly, the Chinese national government has initiated projects aiming to trigger more local experimentation in line with the idea of area-based approaches. This chapter investigates whether Chinese local authorities have the willingness and ability to perform decentralised policies and tasks. This chapter also explores the development of desired area-based approaches on energy transition. It then zooms in on four case study cities through a national pilot programme, 'New Energy Demonstration City (NEDC),' and shows how the cities express only modest willingness and ability. When compared to other local priorities, local performance is constrained by inadequate local technical and managerial ability in purusing integrated and area-based policies and a possible weak profile of renewable energy as compared to other priorities such as GDP growth; moreover, local performance indicates a limited local scope of influence over energy transition-related challenges further reducing local willingness and ability. Local willingness and ability therefore cannot simply be assumed to exist by itself, and more is needed; this chapter concludes that decentralisation in Chinese energy governance should take place in a context of central government support and stimuli, and also highlights the national policies and regulations that will enable and activate local authorities and stakeholders to pursue energy transition policies.

Sub-question 3: How is policy integration on energy transition pursued in urban China, and how does Chinese centralised governance allow for, or constrain, local integrated energy policies?

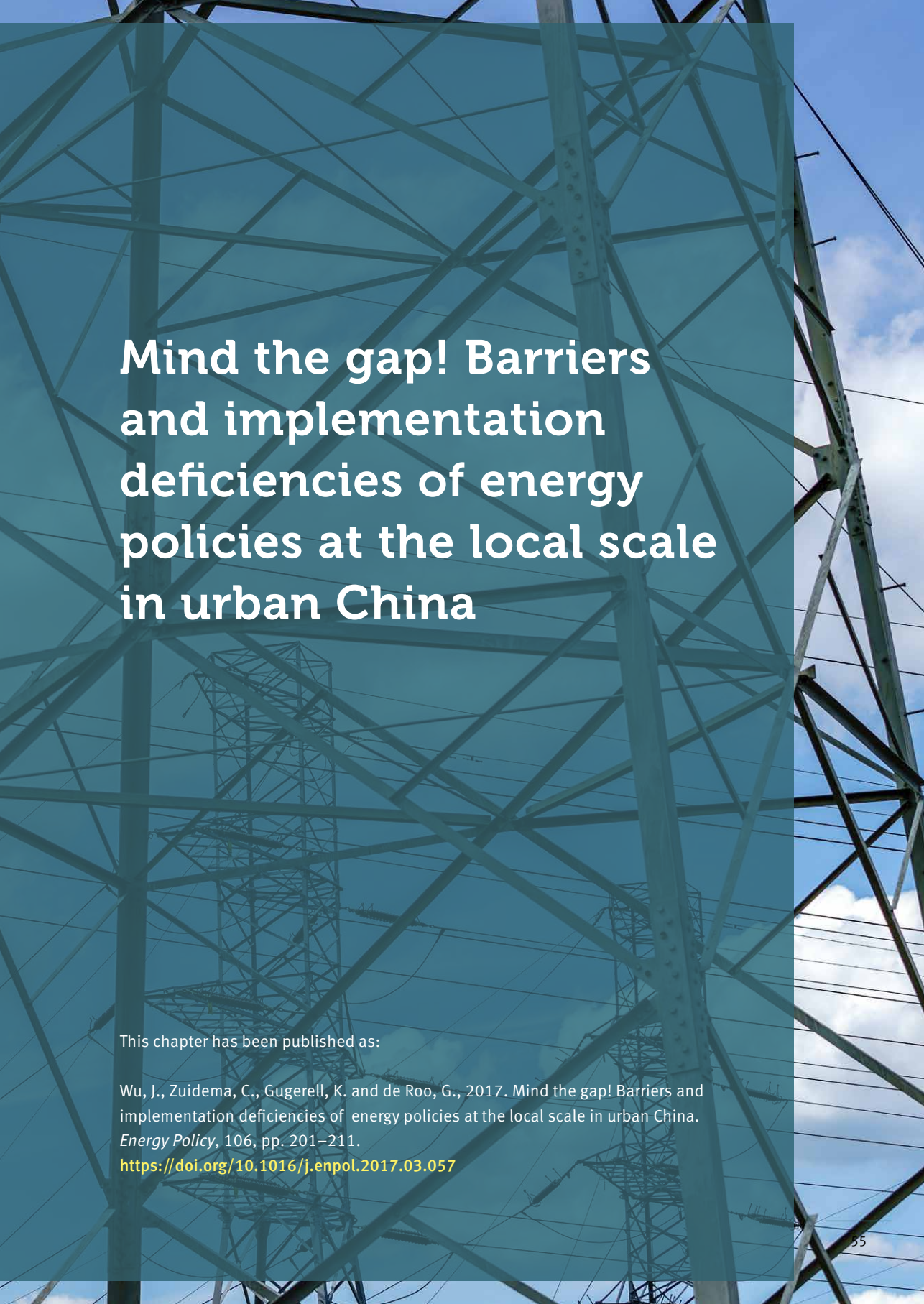
In Chapter 4 energy transition requires actions beyond what the energy sector alone can deliver and thus calls for a degree of policy integration. Notably in a local realm, the spatial and socio-economic implications of energy transition urge for cross-sectoral working. This chapter uses the lens of climate policy integration, which has emerged as an important strategy to respond to energy concerns in which energy issues can be governed by multiple sectors taking collective responsibility for a common objective. This chapter then uses two cases to analyse how the integration of energy ambitions within non-energy sectors manifests at the local level in urban China: Chengdu (Low-carbon city project) and Yangzhou (New Energy Demonstration City Project). Results show weak climate policy integration in both cases, while identifying key barriers that currently frustrate such integration, even in proactive and ambitious cities. Based on this finding, this chapter points to some key questions to be asked on how hierarchical, top-down and sectoral governance can and should interact with local attempts to pursue cross-sectoral policy approaches.

Sub-question 4: How are local collaborative energy practices shaped by existing institutional rules and regulations; how are the roles of actors defined in Chinese energy governance? What are the barriers and opportunities to multi-stakeholder collaboration?

Chapter 5 conducts an institutional analysis by enriching the Institutional Analysis and Development (IAD) framework (Ostrom, 2011) to investigate how current institutional rules and routines affect collaborative governance in local energy practices. Specifically, the analysis seeks to identify institutional barriers and opportunities for such collaborative governance. Guangzhou and its decentralised photovoltaic (PV) power generation project is the case study highlighted in this chapter. The analytical approach applied here goes beyond focusing on identifying the formal and established 'rules of the game'. It also considers how actors react to the rules in the 'play of the game'. As such, the case study analyses both formal and informal patterns of interactions of collaborative governance in local energy practices. Results show that grid operators hold the monopoly position in the development of the decentralised PV project, and such uneven power between actors is the main reason for the chain of problems in the decentralised PV industry.

Finally, **Chapter 6** draws together the various insights gained from Chapters 2 to 5 in a discussion on findings and in a general conclusion. Thereby, it provides a summary of the main findings of this thesis and gives implications and recommendations for policy-makers on which conditions are conducive for implementing energy transition policies in urban areas. In addition, this chapter also contains reflections on the theoretical frameworks and methodology used for this study. Lastly, this chapter provides suggestions for further research.

2



Mind the gap! Barriers and implementation deficiencies of energy policies at the local scale in urban China

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2 Mind the gap! Barriers and implementation deficiencies of energy policies at the local scale in urban China

ABSTRACT

Environmental concerns and potential social-economic impacts associated with fossil fuels have turned cities into indispensable entities for supporting energy transition in China. Pursuing a transition towards a sustainable energy system has become a major policy concern for the Chinese central government. In response, and on the basis of a top-down and conformance-oriented system of policy implementation and evaluation, the Chinese central government has launched various policies and targets on energy efficiency and production that lower levels of government have to follow. However, the translation of top-down targets and the measurement of conformance-based targets have both proved to be problematic. This chapter investigates Chinese state policy on energy efficiency through four empirical case studies. It identifies how policy design of target setting and evaluation is both impacting and driving the implementation of energy efficiency at the local urban scale. Findings demonstrate how local authorities are faced with constraining barriers that can inhibit the implementation of centrally issued targets and policies. These barriers may even undermine local performance in the pursuit of ambitious energy efficiency goals, resulting in potentially harmful consequences.

KEY WORDS: Target responsibility system; Chinese energy efficiency policy; Implementation deficiency; Local scale; China

2.1 Introduction

Cities worldwide are currently estimated to use 75% of the world's energy and contribute to 70% of the global energy-related greenhouse gas (GHG) emissions from fossil fuel usage (Baeumler et al., 2012; Hillman and Ramaswami, 2010). In China, rapid economic growth and urbanisation have turned the country into the largest carbon emitter worldwide (IEA, 2013). Both phenomena are built on the foundation of fossil fuel usage, with coal and petroleum accounting for more than 80% of China's energy consumption in 2012 (EIA, 2015). As a consequence, significant environmental and health impacts are emerging, especially in urban areas (e.g., Liu et al., 2016). Moreover, at present less than one percent of China's 500 largest cities meet World Health Organisation (WHO) air quality standards (Liu et al., 2014; Zhang and Crooks, 2012). As illustrated by the example of China, cities are seen as vital research cases for energy transitions (Rotmans et al., 2001). It is research that means to understand how cities contribute to the development of sustainable urban energy systems characterised by renewable energy resources and efficient energy use (Droege, 2011).

In response to these pressures, the Chinese central government has set ambitious targets to be achieved by 2020: (1) a reduction of CO_2 emissions per unit of GDP by 40-45% relative to 2005 levels, and (2) an increase of up to 15% in the non-fossil energy share of total primary energy consumption (State Council, 2009). A number of different energy policies have been introduced by the central government with the aim of reaching these objectives. In this paper we will investigate the Chinese energy efficiency policy framework, which is central to Chinese energy transition policy making. The implementation and attainment of energy efficiency targets at a local level is compulsory, and is steered top-down by the central government. The central government issued compulsory energy efficiency targets in the 11th (2006) and the 12th (2011) Five-Year-Plan (FYP): Energy intensity, measured as CO_2 emissions per unit of GDP, should decrease by 20% between 2006 and 2010 (State Council, 2006) and by a further 16% during the 12th FYP (2011-2015) (State Council, 2011a). The central government's confidence was high when these mandatory energy intensity targets were translated to top-down implementation schemes for lower levels of government and were supported by a strict conformance-based measuring system to validate implementation at a local level. Xu Shaoshi, Minister of China's National Development and Reform Commission (NDRC), stressed the strict implementation regime during the 8th session of the 12th National People's Congress (NPC) Standing Committee saying: "we need to keep pushing energy efficiency policies with an 'iron hand' to ensure these binding targets are achieved" (NPC, 2014).

The strict energy targets and strong adherence thus far to pushing with an 'iron-hand' regarding implementation, have resulted in creative but also rather problematic implementations at the local scale. To illustrate: in 2010 the local government of Anping County

cut off water and electricity supplies in residential neighbourhoods, forcing hospitals to shut down health-care one day per week, and traffic lights to be switched off, to ensure that policy goals were met in the final year of the 11th FYP (China Greentech Report, 2013). Such extreme measures arise from local authorities feeling compelled to meet national FYP targets at any cost. The result is a real risk that the current use of strict central targets and top-down implementation will overlook the interrelatedness of energy systems with other local societal systems by forcing local authorities to comply with an a-priori prioritisation of energy targets above possible other essential local needs. In the meantime, academic research has convincingly shown that shifting to a sustainable energy system is a complex process involving multiple societal changes, ranging from economic and behavioural change, to the development of new technologies and the consideration of spatial changes (Kemp and Loorbach, 2006; Scrase and Mackerron, 2009). Energy production from renewables, for instance, requires much more space than production from fossil sources (Sijmons and Van Dorst, 2012). Another issue is that households, companies, trade associations, and other social organisations will have to alter their prevailing attitudes and responses towards new energy systems (Andrews-Speed, 2012). In effect, both a large variety of activities and actors have to be involved in the shift to a more sustainable energy system. These actors and stakeholders vary in their aspirations, visions, wishes, perceptions, and knowledge and may thus generate tensions and conflicts between policy priorities, notably at the local scale where diverse aspects need to be balanced (e.g., De Boer and Zuidema, 2015; Wüstenhagen et al., 2007).

Clearly then, energy issues do not occur in isolation, but are interrelated with other local issues, policy ambitions and stakeholder interests that collectively influence policy development and implementation. As such, shifting to a sustainable energy system within a local realm is ideally based on an understanding of the interrelatedness of energy systems with the local socio-economic and physical circumstances (e.g., De Boer and Zuidema, 2015). Such an understanding can be difficult to translate into centralised policy formats and initiatives, as these tend to be less capable of responding to various unique and detailed local circumstances and stakeholder interests (e.g., Burström and Korhonen, 2001; De Vries, 2000; Zuidema, 2017). Instead, it seems sensible to at least allow local authorities some flexibility in implementing central policies so as to respond to specific local circumstances and stakeholder interests (e.g., Matland, 1995). Such flexibility seems especially relevant when policies mean to impact highly different localities, such as in China. China is a large country and local circumstances vary greatly across different regions, including differences in resources used, geography, demography, and the social-economic status and related structure of the economy. Although the Chinese energy efficiency policy framework does take some varying local circumstances into account by assigning localities different targets, it remains unclear if the framework allows for flexibility in the face of the highly different Chinese localities. Our ambition is to investigate how the Chinese energy efficiency policy framework functions when applied under very different local circumstances.

The present thesis research departs from previous studies concerning the implementation of Chinese energy efficiency policy. Some of these studies examined what actions and measures were employed by local authorities to conform with state planning mandates (e.g., Kostka and Hobbs, 2012; Zhang et al., 2011; Zhao et al., 2014). Others paid attention to interpreting the phenomenon of policy implementation gaps (e.g., Lo, 2014a, 2014b; Wang, 2012). Nevertheless, these previous studies have predominantly zeroed in on one particular area, especially in energy-intensive and industrialised regions such as Shanxi province and Changchun city. Hence, they are only offering limited information about how the Chinese energy efficiency policy framework functions under different local circumstances. Furthermore, these studies focus on identifying reasons for poor implementation of energy efficiency by specifically addressing the rigid, top-down target allocation system in China (Kostka, 2015; Zhao and Wu, 2016). They pay less attention to the way in which implementation is evaluated and localities are held accountable. International studies on policy implementation have shown that evaluating policy success need not just be about controlling conforming to targets, but might also assess how the targets influenced the actual work or performance of implementing authorities within different contexts (e.g., Oliveira and Pinho, 2010). Moreover, performance oriented evaluation has rarely been discussed in Chinese academic debates (e.g., Tian and Shen, 2011). Therefore, we will investigate the Chinese energy efficiency policy framework to understand how policy design on both target setting *and* evaluation is impacting and driving the implementation at the local scale.

Next, in section 2.2 we introduce and discuss the notions of conformance and performance in relation to policy implementation. This discussion serves as background for the analysis of the Chinese policy framework on energy efficiency in section 2.3. In section 2.4 the methodology outline how four different Chinese city municipalities have responded to national energy efficiency policies. In section 2.5 we discuss the coping mechanisms of these municipalities with the energy efficiency policies and bottlenecks that local governments are suffering from. There is a reflection on the Chinese approach in our concluding section 2.6, where we argue for increased flexibility in both of the targets set by the central state as well as the system of measuring policy success so as to promote an improved performance towards reaching energy efficiency targets.

2.2 Conceptual discussion related to policy implementation

Up until the 1970s, policy implementation was rarely on the agenda of policy scientists (e.g., O'Toole, 2000; Schofield, 2001). Instead it was largely assumed, with a high degree of certainty, that well-designed plans and policies would deliver their objectives. Starting with authors such as Pressman and Wildavsky (1973) and Derthick (1972), it became increasingly clear that policy implementation proved to be much less

evident in practice than had been previously expected. A rich academic debate grew apace (e.g., Goggin, 1990), prominently featuring studies on balancing the desire for effective top-down policy delivery in the local realm with the desire to allow for locally sensible policy responses (e.g., Elmore, 1979; Matland, 1995; Sabatier et al., 1986). These studies demonstrate that degrees of local discretion in dealing with centrally stated policy ambitions indeed depend on a combination of policy design and policy evaluation.

Local discretion is firstly influenced by how central policy ambitions are expressed and assumed to be translated across multiple tiers of government. As was explained by scholars, such as Elmore (1979) and Sabatier (1986), central policies can allow for different degrees of differentiation based on variations in local circumstances. At one extreme, central policy ambitions are generic with each lower level of authority being expected to meet the same uniform targets. Alternatively, central policy ambitions can also be differentiated with different localities being expected to deliver different targets based on different local circumstances. In both cases policy implementation remains top-down, but in the latter case it is sensitive to knowledge of the detailed local circumstances. Acquiring such knowledge can, however, be problematic for central governments (Burström and Korhonen, 2001; De Vries, 2000; Fleurke and Hulst, 2006), thus implying that differentiation in targets might fail to sufficiently take local circumstances into acount. Consequently, it is also possible to allow for some flexibility in central ambitions itself, as discussed by Matland (1995) and Sabatier (1986). Central policy ambitions can then be stated in more strategic or ambiguous terms in order to allow for modifications to these policies as they get translated to lower levels of authority (e.g., DeLeon and DeLeon, 2002; Yanow, 1998). In this way, local circumstances are able to directly influence the development of local policies in a context of centrally stated policy ambitions.

This discussion of target setting also brings us to the ways in which central governments evaluate policy implementation as is expressed with the difference between conformance and performance (e.g., Mastop and Faludi, 1997; Oliveira and Pinho, 2010). To date, the research on policy implementation in relation to policy evaluation in China has received limited attention. As Tian and Shen, p.11 (2011) state, "… there has been few publications addressing the evaluation of plan implementation". A strong focus of existing studies has been on the instrumental use of disparate evaluation criteria on conformance and performance to assess plan implementation, such as in land use (e.g., Zhong et al., 2014). However, a conceptual discussion through the lens of conformance and performance to understand policy implementation has been lacking. This discussion would also provide an alternative perspective to reflect on the Chinese strategy on energy efficiency.

Conformance follows a straight, linear logic between policy intent and policy outcomes (Faludi and Altes, 1994) and assumes a direct one-to-one relationship where outcomes of policies should directly support the objectives, intent and measures expressed in a plan or policy. Therefore, conformance essentially assumes that policy success depends on whether consequences in practice are consistent with policy-makers' initial plan. Alternatively,

'performance' shifts our attention to what happens with the policy (Faludi, 2000) or plan and whether plans 'facilitate decision-making' (Faludi, 1989, p. 138). Performance considers plans, policies and even targets as a guide for future decisions and emphasises the planning processes that occur after the initial plans and policies are adopted (Alexander and Faludi, 1989; Baer, 1997; Mastop and Faludi, 1997). Instead of conformance to stated ambitions and targets *per se*, performance focuses on the process of 'getting something done' (MacLeod and By, 2007, p. 335). In this approach, outcomes do not need to adhere strictly to ambitions and targets set. Instead, success is defined by the degrees to which implementers have actively engage with these ambitions and targets, including how they 'perform' within a context of both the targets and the detailed circumstances they face. Modifications to these ambitions and targets are then permissible and possibly desirable. The idea being that practice needs to be adaptive to an ever-changing and situational environment, that is confronted with many uncertainties and conflicts, whilst also loosely coupled within societal institutional settings (Laurian et al., 2004). Therefore, as De Roo, p.118 (2003) argues, "the performance of decision-making is a phenomenon in planning that clearly derives from a growing recognition of the role and position of actors in various institutional contexts". Performance thus highlights situational contexts and sees planning issues as strongly interwoven within local institutional contexts.

The choice between a strict top-down, conformance-oriented policy design and a more flexible bottom-up, performance-oriented policy design can be connected with conditions of complexity. De Roo (2003) argues that policy conformance is most suitable if the issues and circumstances faced are of limited complexity. Such issues and circumstances are characterised by relatively straightforward, clear cause-and-effect relationships and where there is little societal debate on the objectives to pursue and the interventions to take (see also Christensen, 1985; Zuidema, 2017). Under such circumstances conformance to ambitions and targets seems not only feasible, but is also considered as widely accepted. Supported by strong top-down and 'command and control' policy design, conformance is now often preferably used as an evaluation criterion so as to ensure that dictated objectives are achieved (Brody and Highfield, 2005; MacLeod and By, 2007).

When conditions of complexity increase, cause and effect relationships become increasingly 'fuzzy' and there are usually multiple, interdependent and potentially conflicting goals needed to be pursued (e.g., Christensen, 1985; de Roo, 2003; Zuidema, 2017). Moreover, participating actors, available resources, problems and potential solution strategies will differ according to specific local circumstances (see also Cohen et al., 1972). Under these circumstances it becomes attractive to balance alternative local interests and priorities based on how they are locally interrelated and context-dependent. Pursuing policy targets set a-priori to such balancing can be problematic, as it fails to take such interdependencies and contextual circumstances into account. Policies drafted a-priori can be commonly seen in a Chinese governance system. For example, Liu et al. (2012) show how Chinese environmental governance approaches "make local governments meet specific targets but ignore other environmental challenges. It creates institutional lock-in where only some

urgent environmental challenges are addressed, while complex social-ecological changes can always generate new challenges" (p. 108). Thus, adopting a top-down and command-and-control policy approach with strict, centrally issued targets and compliance-based policy evaluation not only seems to be less effective but also less desirable. Instead, issues would ideally be dealt with by also allowing for a bottom-up and area-specific approach, which considers local circumstances and the interrelationships between various interests and priorities (De Roo et al., 2012). However, with performance, it is the explicit intent to allow ambitions and targets to be translated within a context of local situational circumstances and to become more tailor-made to unique local contexts. Thus, performance-based evaluation is now attractive as it also defines a plan or policy as a learning process (Oliveira and Pinho, 2010) and emphasises the suitability of a plan where decision-making should be adapted to the surrounding contexts.

Obviously, degrees of conformance and performance oriented policy evaluation can be mixed, where both meeting targets whilst respecting local circumstances can be combined (e.g. Matland, 1995; O'Toole, 2000). Current Chinese practice remains strongly focused on conformance oriented evaluation and is reliant on top-down and command-and-control approaches (e.g., Tian and Shen, 2011). Pursuing energy efficiency will certainly affect pursuing other local policy priorities and the exact interrelationships between energy efficiency and these priorities will also be different given the vast differences in local circumstances across China. Hence, focusing largely on conformance might well pose a risk within the current design of the Chinese energy efficiency policy framework.

Firstly, top-down target setting may fail to be sensitive to wide variations between cities, especially as the central government might not have the available knowledge of local differences to set the 'right' targets (Kostka, 2015). Secondly, the conformance-oriented policy evaluation might even aggravate problems and could force local authorities to prioritise the superimposed targets (e.g., energy efficiency) at the expense of other policy priorities (e.g., spatial, environment, social, economic, etc.). The adverse consequences regarding one of these other priorities might even become extreme, as the example of Anping County vividly illustrates. Finally, a focus on only conformance could possibly overlook actual local performance. For example, a city that does not conform to targets may still have made impressive improvements despite difficult local circumstances, whilst a city that does conform may have made fewer improvements and instead be benefiting from favourable local circumstances. Hence, a conformance perspective might fail to neither capture what has actually happened locally nor place local action beyond the frame of conformance. In our discussion of the empirical findings in section 2.5, we will also show that each of these three issues is indeed relevant for understanding and evaluating China's energy efficiency policy framework.

2.3 An urban energy transition strategy in Chinese central government

In China, energy intensity is a measure used in policies to estimate and assess energy efficiency at the national macro level, by relating the units of energy to the unit of GDP (Price et al., 2011; 2010)the Chinese government announced an ambitious goal of reducing energy consumption per unit of gross domestic product (GDP. Energy efficiency essentially implies using less energy in a system for performing the same function (Oikonomou et al., 2009). Various scholars advise that measuring energy efficiency based on energy intensity data can be misleading (Kapusuzoglu and Karan, 2013; Proskuryakova and Kovalev, 2015) because: "Energy intensity does not provide a basis for specific recommendations on energy efficiency development…and the direct outcome of decreasing energy intensity is decoupling economic growth from energy consumption…such decoupling does not necessarily result in achieving ultimate energy efficiency" (Proskuryakova and Kovalev, 2015, p. 458).

To achieve its energy intensity targets, the Chinese central government has developed a variety of national policies. The strongly hierarchical administrative system leaves little room for deviations from top-down issued targets. Hence, there is only limited room to negotiate targets between different levels of government or at the local level between local energy departments and other local policy departments or stakeholders (Qi, 2013). The *Action Plan on Energy Efficiency and Low-carbon Development (2014-2015)* (State Council, 2014), and other sectoral energy efficiency policies (i.e., for industry, building and transport) present good examples of this model.

Our document analysis of current Chinese national energy efficiency policies and regulations shows that these are strongly technical and standardised[1]. They provide clear details on specific quantitative targets that the lower levels of authority need to meet. Such concrete targets in the 12th FYP period, for example, dictate the specific reduction of main pollutants in air (SO_2, -8%; NO_x, -10%) and water (NH_4, -10%); and the specific energy intensity reduction in railways (-15%), commercial vehicles (-5%), and the aviation industry (-5%) (MOT, 2011). Other savings are to be realised in a 116 Mtce reduction of energy use in public buildings (MOHURD, 2012); more small fossil fuel-fired power plants needing to be shut down; and strict restriction standards being put in place for high energy consumption products, covering appliances related to lighting, heating and cooling. These national targets are mandatory for

1 These include: 11th FYP Medium and long-term plan for energy conservation (NDRC, 2004); Comprehensive work plan for energy conservation and emission reduction for the 12th FYP period (State Council, 2011a); 12th FYP Energy conservation and emission reduction (State Council, 2012); Action plan on energy efficiency and low-carbon development (2014-2015) (State Council, 2014); 12th FYP Building energy conservation plan (MOHURD, 2012); 12th FYP Road and water transportation conservation plan (MOT, 2011).

lower tiers of government. The energy efficiency targets do show some variation inspired by different regional circumstances. Nevertheless, variation arguably remains modest, focused only on provinces and with the 31 provinces classified into only five tiers (Table 2.1).

Table 2.1 Proted energy intensity reduction targets in the 12th FYP period

Target	Provinces	Provinces missing targets (until November 2015)
18%	Tianjin, Shanghai, Jiangsu, Zhejiang, Guangdong	-
17%	Beijing, Hebei, Liaoning, Shandong	-
16%	Shanxi, Jilin, Heilongjiang, Anhui, Fujian, Jiangxi, Henan, Hubei, Sichuan, Shannxi, Hunan, Chongqing	-
15%	Inner Mongolia, Guangxi, Guizhou, Yunan, Gansu, Ningxia	Ningxia
10%	Hainan, Tibet, Qinghai, Xinjiang	Xinjiang, Hainan, Qinghai

Source: State Council (2011a); NDRC (2015)

The exact allocation of municipal targets and the evaluation of policy implementation are based on the 'Target Responsibility System (TRS)'. Rules of TRS mainly include (1) allocating fixed mandatory targets for lower-level authorities, stepwise, from national to provincial (see Table 2.1) and from provincial to municipal and county levels (Fig.2.1); (2) signing 'Target Responsibility Contracts' layer by layer between upper administrative level governments, their subordinate authorities and key energy-consuming enterprises; and (3) evaluating the implementation outcomes on whether the required targets are met. Most importantly, the TRS dictates that local officials and enterprise leaders have to be held accountable for the implementation results: achieving the targets is a matter of importance for local leaders, who are assessed annually on their political presentation, and can be key to their political careers (Lo, 2014b; Zhao et al., 2014). The direct target 'delivering' and 'accountability' system is therefore a powerful incentive and a significant tool for compelling officials at each governmental level to conform to targets, instructions or policies issued by the central government (also Wang, 2012). Fig. 2.1 indicates that each government at a higher level can directly translate targets to subordinate authorities, while local governments are mainly responsible for implementing and reaching them.

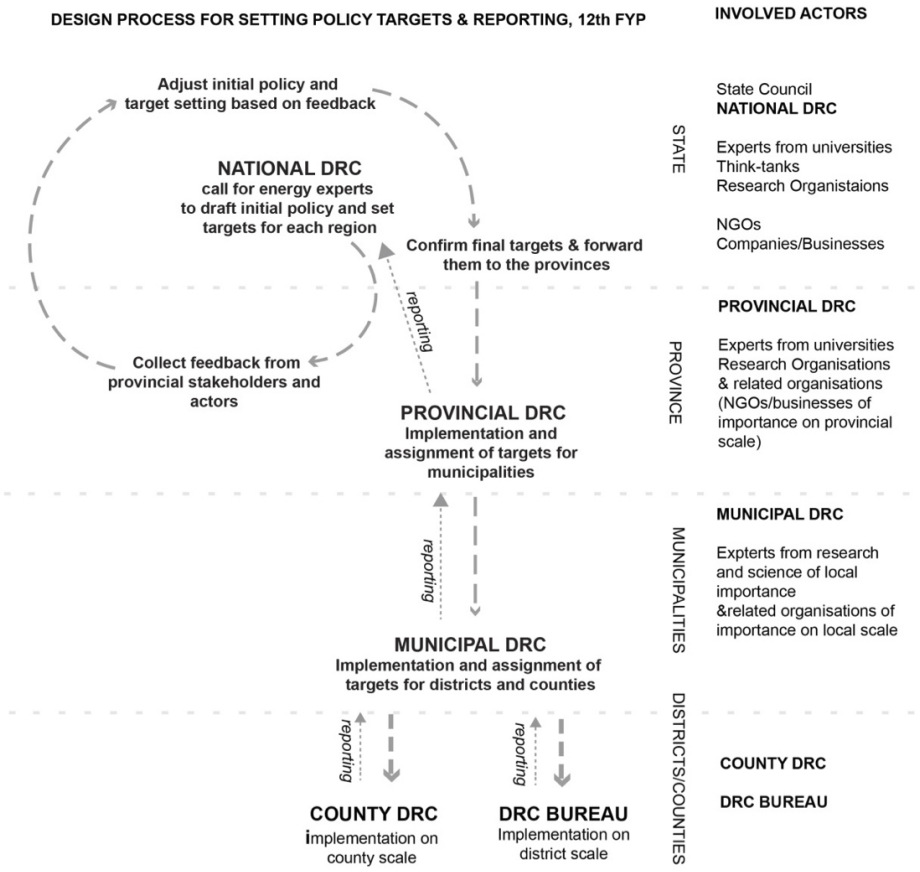

Figure 2.1 Energy-intensity target setting and translation process during the 12th FYP period (Source: according to Li et al., 2013)

Next to target setting, the TRS evaluation framework sets procedures, rewards and penalties into quantifiable variables (State Council, 2007). Those variables are then translated into a nationwide scoring system to hold local authorities accountable according to a centrally decided benchmark. Lower level governments are allowed to add elements to this evaluation scheme, but they must also remain within the reference of the central government issued system. This means that local authorities can add stricter measures to guarantee that targets are successfully reached in addition to having to comply with the two state-issued evaluation criteria of 'Target-Checking' and 'Action-Checking' (Table 2.2). 'Target-Checking' assesses the compliance to allocated targets and comprises 40% of the total score. The remaining 60% corresponds to the second criterion, referred to as 'Action-Checking' (State Council, 2007). Here, local governments are assessed on how they followed mandatory tasks in order to reach their energy efficiency improvements. Examples of such measures include establishing and implementing an energy benchmarking system, monitoring energy consumption for lower-level governments, and having critical enterprises meet given targets (Table 2.2).

To some extent, 'Action-Checking' seems to capture local performance. After all, it is not directly interested in meeting the target, but rather in 'getting things done'. However, as Lo indicates, these actions are largely focused on organisational tasks and "are symbolic, can be easily achieved, and are not directly related to the implementation of low-carbon policies" (2014a, p. 241). Even if 'Action-Checking' was to be seen to capture performance, the most important aspect of the TRS is that 'Target-Checking' is designated as a 'veto criterion', which means that if assigned targets are not met (non-conformance), policy implementation will always be evaluated as failed. Conformance is thus crucial for municipalities in gaining further state support and for the future career paths of local officials and enterprise leaders. This does not mean that 'Action-Checking' is of no relevance. In the case of conformance, a higher overall score increases the likelihood of cities to attract additional provincial or state support and opens opportunities for local leaders to be promoted. Also, in the case of non-conformance, a higher overall score might act as a buffer to reduce state or provincial pressure and negative impact on future careers. Still, what stands out is that the score received is much less relevant than meeting the targets. Even if we regard the score received as representing performance, conformance is still the main driver for local action.

Table 2.2 TRS – Target Responsibility System sets a national scoring framework for energy intensity

Target-Checking	Contents	Scores	Details
(40%)	Reduction in Energy consumption per unit GDP	40	40 points for meeting the target, 36 if finished 90%; 32 if finished 80%; 28 if finished 70%; 24 if finished 60%; 20 if finished 50%; no points below 50%. 3 extra points for exceeding the target by 10%, maximum 9 extra points. If not 100% (40 points), the overall evaluation will be 'fail'
Action-Checking (60%)	Adjust and optimise industrial structure	20	• Increase the share of the tertiary industry (4 points) • Expanding high-tech industry (4 points) • Evaluating energy conservation in fixed assets investment projects (4 points) • Achieving the annual targets of closing down backward production projects (8 points)

	Financial investment and key projects implementation	10	• Setting up a special fund for energy conservation (3 points) • Increasing the proportion of expenditure on energy conservation (4 points) • Implementing major energy conservation projects (3 points)
	Technology investment and use	9	• Including energy conservation technologies into annual technology development plan (2 points) • Increasing the expenditure of developing energy conservation technologies (3 points) • Implementing energy conservation demonstration projects (2 points) • Promoting energy-saving products and technologies (2 points)
	Energy intensity reduction in key enterprises	8	• Achieving the energy reduction targets of key energy-intensive enterprises (3 points) • Monitoring energy intensity reduction in key enterprises (1 point) • Achieving the targets of implementing energy-saving standards for new buildings (4 points)
	Law and regulation implementation	3	• Implementing energy saving law (1 point) • Monitoring law implementation (1 point) • Implementing limiting standards for energy-intensive products (1 point)
	Target Allocation	3	• Allocating targets to lower levels of government (1 point) • Evaluating target attainment in energy reduction (1 point) • Publishing energy consumption statistics (1point)

	Rewards and penalties	5	• Capacity building (1 point) • Improving energy statistics system (1 point) • Implementing training system (1 point) • Reward and penalty system (1 point) • Equipping energy measuring instrument (1 point)
	Coordination and monitoring ability	2	• Setting up an evaluation and monitoring system (1 point) • Setting up a coordination working mechanism (1 point)
Total		100	

(*Source:* State Council, 2007)

2.4 Case and methods

The thesis research follows a qualitative case study approach: the four case study cities have been selected to cover a broad diversity of different urban conditions such as resource distribution, population size, industrial structure, and economic development. The diversity of urban conditions is intended to investigate whether the cities exhibit different responses and coping mechanisms based on their particular context and conditions (Fig. 2.2).

Lanzhou (population: 3.61 million) and Hohhot (population: 2.86 million) are located in the north west of the territory. Both cities are economically underdeveloped areas and are still heavily reliant on the traditional industrial model of high energy demand (e.g., coal, petroleum and gas). They are providing electricity and industrial materials for other Chinese areas. For example, over one-third of the annual power supply generated from fossil fuels in Inner Mongolia (where Hohhot is located) is exported to other regions, especially to the higher developed China East coast (Liu, 2015). Liu (2015) noted that carbon intensity in such fossil-rich provinces is generally over five times higher than in developed economic regions. Striving hard for increasing the GDP, both cities are challenged to balance the GDP goal with the goal of reducing energy intensity.

Yangzhou (population: 4.4 million), is located in the economically strong eastern part of the country. Its strong economic development is depending on resources from fossil-rich areas in China. Statistical data shows that 96.5% coil, 90% oil and 54.3% gas are extra-regionally supplied (Yangzhou New Energy Model City Plan, 2012). In different policies and strategies

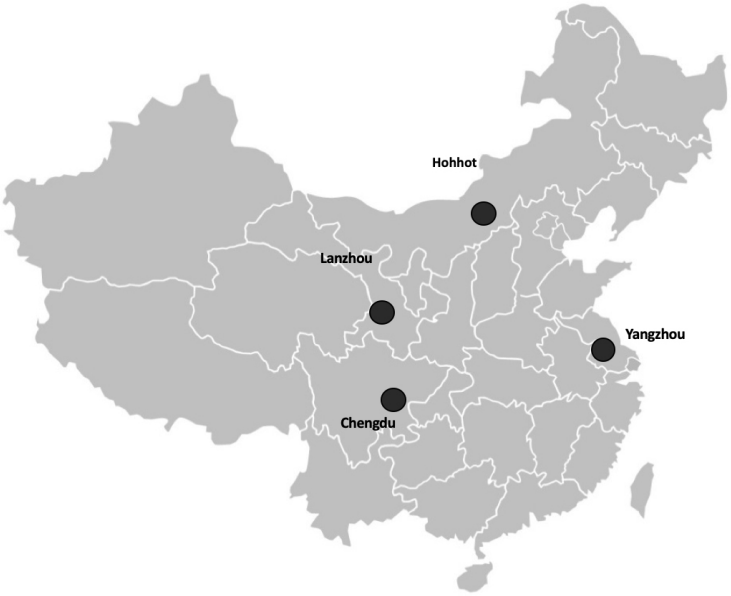

Figure 2.2 Location of the four case study municipalities (Source: Authors)

the city commits to the goal of reducing its energy intensity and its external dependency on fossil-fuel. Chengdu (population: 14.4 million) is located in mid-west China. Chengdu's economic performance is based on the service sector, which already surpassed the industry sector in 2013 (Chengdu Statistical Yearbook, 2014). Chengdu is rich in natural gas and coal resources and is thus comparatively self-sufficient regarding its energy supply.

The research is based on a document and policy analysis including legal documents, reports and Chinese research reports.[2] In parallel, an explorative focus group at a workshop in China was conducted for an initial screening (China Decentralised Energy System, 22-25th December 2014, Guangzhou). The policy analysis and initial screening formed the basis for the case study selection and the development of the interview guidelines for the semi-structured interviews. 25 interviews were conducted at the on-site fieldwork in November and December 2015 in the four case study cities: Lanzhou (6 interviews) Yangzhou (6), Chengdu (5) and Hohhot (5). Three interviews were conducted in National Governments and in the National Renewable Energy Research Institute in Beijing. The interviews include 16 with different levels of government (national, provincial, municipal, district) and different departments that are occupied with energy related matters (Departments of Energy, Resources and Environmental Protection, Planning, Industrial, and Economy); 5 with academic scholars; and 4 with project managers of energy enterprises. The interviews were transcribed and a qualitative content analysis was performed with ATLAS.ti (Mayring, 2015).

2 These include: Renewable Energy and Energy Efficiency in China: Current Status and Prospects for 2020, 2010; Annual Review of Low-Carbon Development in China, 2013; governmental policy documents (e.g., provincial and municipal energy conservation plans); and media reports.

2.5 Does that work? Bottlenecks and implementation inefficiencies at the local scale

In this section the responses and coping mechanisms in the case study cities are discussed. We use the perspective outlined in section 2.2 to illustrate the case study cities' approaches to cope with the national energy intensity policies.

Target setting

During the period of the 12th FYP, the four case study cities received the following mandatory targets for reducing their energy intensity (Table 2.3): Lanzhou, 17%; Hohhot, 16%; Chengdu, 16%; Yangzhou, 17%. It can be seen that only minor differences exist in target setting although major differences exist regarding the general local conditions and economic viability. To help local governments to achieve given targets, the Chinese central government provided a series of specific measures and tasks that were detailed in the *12th FYP Energy conservation and emission reduction* (State Council, 2012). These tasks were compulsory and local governments were required to implement them. The selected key tasks include:

- Closing down small plants and eliminating obsolete production capacity in the areas of power generation, iron and steel, electricity, aluminium, calcium carbide, coke, coal, cement, and flat glass. For example, the plan calls for closing 20 Gigawatts (GW) of small thermal power generating capacity and inefficient production facilities responsible for 480 million tonnes of iron and 480 million tonnes of steel capacity. In addition, inhibiting the development of high energy-consumption industries and encouraging renewable energy use.
- Ten key energy-saving projects: aiming to increase energy efficiency through optimising their economic structure and by promoting more energy efficient technology. Initiatives including coal-fired industrial boiler retrofits, district cogeneration projects, petroleum conservation and substitution projects, and energy system optimisation are described.
- Top-1000 enterprises programme: central government setting clear energy efficiency targets and responsibilities to China's largest energy-consuming enterprises, which are from nine sectors such as iron and steel, coal mining, textiles and paper.

Even though the case study cities were all regulated under national measures, they exhibited a high level of variation in their coping mechanisms. Our findings show that Lanzhou and Hohhot felt greater pressure, than compared to Chengdu and Yangzhou, in coping with the above-mentioned national tasks and in meeting the given energy intensity targets.

Economically weaker cities, like Lanzhou and Hohhot, were under increased pressure by central government to catch up with other cities in terms of economic growth and thus to narrow the economic gap between themselves and the economically more advanced regions

(State Council, 2011b). Hence, next to stimulating GDP growth, the cities also have to target energy reduction in their heavy industry based economy. Thus, governmental officials argued that the energy policy and targets are not reflecting local conditions and are in conflict with local capacities and policy priorities, especially fostering revenue growth and increasing the local GDP. Boosting GDP growth and creating jobs are also crucial for the local leadership, because the central government assesses the performance of the local leadership based on those criteria. The case studies illustrate that success and overachievement are beneficial for pursuing individual career pathways, which aligns with work from Jia et al. (2015). Policy targets such as job creation, GDP and revenue growth, and the improvement of local livelihoods are rigid and compulsory national targets. Non-attainment reduces both individual career prospects and potential political rewards (HUHT02, 2015).

Furthermore, the research illustrates additional local tensions resulting from the relocation of energy intensive industry to the western part of the country, such as Hohhot and Lanzhou. These relocations are expressed as outcomes of two trends: (1) the national economic policy intending to shift traditional industries to the economically weaker areas to the west, and (2) the companies market compliant behaviour in relocating companies to areas with cheaper production costs: "large-scale high-energy consumption industries and enterprises operating in developed eastern coastal areas have begun to transfer to less-developed western and northern regions due to China's regional economic structure adjustment" (BJ01, 2015). Subsequently, for these cities the struggle to meet the national energy targets might increase, but in parallel the relocations can be beneficial for the goal of GDP growth: "increasing local economy and improving people's well-being is our top priority rather than energy reduction" (HUHT04, 2015), and "we have to grasp the opportunity of the eastern industry transferring so as to speed up local economy" (LZ03, 2015). However, those developments might lead to local tensions: whilst national targets require shutting down energy intense and technically out-dated facilities, these cities still canvass low-efficiency industries and out-dated technological facilities with lower energy and environmental standards. Local representatives are arguing that companies facilitating that kind of technology were, and are, major taxpayers that should be supported. Furthermore, the local governments do not have the financial capacity to subsidise these companies to update their technical standards (HUHT01, 2015). Finally, these two cities are additionally burdened with extra energy expenditures to transfer the energy to economically better-developed areas such as Yangzhou. This is caused by the fact that the energy needed to transport fuel goes on the account of the production area while the consuming area goes free.

Despite already moving towards a service industry, Chengdu's industrialisation level is still somewhere in between the eastern and western regions (Chengdu Scientific Development Report, 2013). Although with less pressure compared to western cities, local governmental officials are still challenged to achieve energy targets: "this industrial structure optimisation is a rather long-term, slow and complex process, which involves local stakeholders' various interests" (CD01, 2015). However, energy reduction targets have to be strictly met within the given time, therefore "we worried about that if we push the agenda of optimisation too

hard or too fast, it could affect social stability, employment and even GDP growth" (CD01, 2015).

In cities with strong tensions between GDP growth and attaining energy targets the need to conform to both can cause dubious last-minute practices during official inspections. Examples include the temporary reduction of energy consumption or even shutting down high-energy industries during such official inspections. These are then re-opened once inspections have passed. "Poorly adapted energy targets and strict evaluation force us to show compliance by whatever measures" (LZ01, 2015). However, similar strategies also occurred in more economically advanced cities like Chengdu: Being easy in general but tight when inspection comes. More specifically, the government assisted to approve and operate energy-consuming projects at the beginning of the year, while once the time came to evaluate the targets, the local authority required 'unfavourable' factories related to steel, petrochemical industries to slow or stop production (CD02, 2015). GDPism may meet with little local government enthusiasm and motivation to push the energy efficiency policy implementation forward. Especially since the relational measure of energy intensity does not convey actual energy reduction and policy performance.

Cities like Yangzhou (high-tech industry) and, to some degree, also Chengdu (service industry) show slightly different responses to Hohhot and Lanzhou due to their different economic context. They have transferred much of their heavy industries to other locations and, combined with a slowing down of their economic growth, they are experiencing a decrease in energy consumption (YZ02, 2015). Compared to the aforementioned two cities, Yangzhou has less pressure in meeting targets for reducing energy intensity. It has achieved a certain stage of industrialisation characterised by shifting to high-tech industries and a modern service industry while the extensive development of heavy industries has slowed down (YZ02, 2015). Consequently, the required tasks and targets, such as closing down small plants and phasing out obsolete production capacity, are relatively easy to implement and achieve. It can even result in them surpassing the national targets.

Target setting by central government has been adapted between the 11th and 12th FYP (Zhao and Wu, 2016) and thus a shift took place from a generic 20% reduction during the 11th FYP to a more nuanced scheme in the 12th FYP (Table 2.1). The cases nevertheless illustrate a certain level of insensitivity in target setting: economic powerhouses with strong GDP growth rates and already changing industrial structures (such as Yangzhou) have to attain more ambitious targets than cities that are energy producing and rely on heavy industry for GDP growth (such as Hohhot or Lanzhou). Their coping mechanisms may reflect the potential problems arising from the present method of setting targets in Chinese energy intensity management. The top-down and relatively generic target setting approach focuses exclusively on attaining energy targets without inquiring into whether these targets provide sufficient incentives in more advanced cities. Furthermore, these targets are pursued regardless of whether or not they are realistic in the face of local circumstances in other cities. Consequently, these targets tend to conflict with policy priorities that local scale authorities

also have to meet, such as their economy and employment circumstances. Policy conflicts are general and global phenomena, but the research illustrates specifics for the Chinese context: (a) GDPism: the goal to boost the GDP results in energy intensity targets being regarded as less crucial, (b) Career prospects: increasing GDP is a key criteria for individual career prospects and political career pathways, and (c) what matters is the goal attainment and policy conformance, not the actions or the process how the goal was achieved. Since non-conformance to energy intensity targets have (personal) political and financial consequences, cities resort to extreme and unreasonable measures to show their compliance with the given decisions. Consequently, the centralised system does not encourage, and even discourages, active engagement at local levels to smartly balance local multiple interests.

Bottlenecks in the evaluation of the policy implementation

As shown in Table 2.2, the current target measuring system consists of two main evaluation frameworks: Target-Checking (40%) and Action-Checking (60%). Target-Checking measures only the reduction of energy intensity whereas Action-Checking offers a range of different actions and measures to achieve policy goals.

Target-checking

The key component of the TRS is the targeted reduction of energy intensity, which is a veto criterion of the evaluation scheme. NDRC data indicates that, until November 2015, only 4 out of 31 provinces did not achieve the energy intensity targets during the 12th FYP (NDRC, 2015). In reaching an overall success rate of 90%, with some localities even over-performing (see Tables 2.1 and 2.3), the policy implementation could be considered a major success. Such over-achievement, as seen in Lanzhou and Yangzhou, is beneficial because it increases the chances to obtain rewards and additional funding from the central government, like the low-carbon city pilot project. Receiving such rewards encourages cities to raise their reputation to attract new investors and business ventures to their cities, and subsequently supports the job market and the core policy goal of GDP growth.

However, a more critical reading of the case study results could also indicate that the high success rates are a consequence of less ambitious goal setting due to less successful policy implementation during the previous FYP period, aligning with the work by (Lo, 2014a). Our case study results align with the work of Ran (2013), showing that creative data handling, downplaying failures, exaggeration of achievements and prettification of single actions and measures are common ground when it comes to target checking: “it is impossible to meet all the given targets, so we have to take whatever actions that can help us showing conformance” (LZ04, 2015). Our case study respondents argued that their imperative has been to stick to these given targets, at least to show compliance to higher levels of government, as the strict compliance-based evaluation directly affects the overall government’s reputation and individual career prospects (CD 02, 2015).

All four cases indicate that the tensions between career prospects, improving city reputation, GDP growth, and achieving national energy goals might lead to a somewhat creative approach regarding data management and analysis. The lack of a coherent standard for measuring energy intensity, along with ineffective energy statistic monitoring systems, creates an action space for the cities to facilitate the most promising methods to present results confirming policy conformance. Additionally, non-standardised data collection, and incomplete and mismatched data regarding industrial energy intensity, forces the cities to base calculations on whatever data they have available. For example, not every industrial enterprise can provide its exact energy consumption data, which leads to the data collected being rather selective. This mismatch exacerbates careful monitoring, adaptation and policy learning: "(…) the serious mismatch of statistical data between national and local governments has turned energy conservation into a high-pressure situation" (NDRC, 2013). As a consequence, deciding on conformance and performance might well become more a matter of (political) choice and interpretation than that of showing evidence.

Table 2.3 Reported data of energy intensity among the four case studies during the 12th FYP

Cases studied	Given targets	Reported target fulfilment
Lanzhou	17%	26.24% (over fulfilled)
Hohhot	16%	16%
Chengdu	16%	16%
Yangzhou	17%	22.1% (over fulfilled)

Sources: Fieldwork; Inner Mongolia Gernal Office (2012); Lanzhou General Office (2011); Jiangsu Gernal Office (2012); Sichuan General Office (2011)

Performance-oriented action checking

Action-Checking (60 points) is the performance-oriented counterpart to Target-Checking in the policy evaluation system. While Target-Checking focuses on the conformance with explicit goals, cities can collect further points by performing different actions in line with national energy intensity policies (Table 2.2). The local officials interviewed perceive the Action-Checking part as an easy assignment. Firstly, if Target-Checking is achieved, Action-Checking is merely a less urgent matter of collecting additional points to move up the 'leader board.' Secondly, many actions are only remotely and indirectly linked to energy conservation, whilst they are also comparatively easy to attain to score points. Hence, meeting actions can support local officials' political careers, whilst only moderately pushing them to perform on energy intensity reductions.

As illustrated in the previous section, some cases including Lanzhou, Hohhot and Chengdu achieved the energy intensity targets by taking dubious measures. These measures helped local authorities to easily meet the targets and show their conformance to national mandates,

and thus the improper implementation process can be easily overlooked. Another example also shows the flaws of the current conformance-oriented policy evaluation. The measure of energy intensity merges economic prosperity and energy reduction, and therefore indicates the general performance and economic growth of the region:

> "At the end of each year, the upper-level governments measure whether the exact target of energy intensity is achieved. Once you know how to play the game, target achieving will not be hard. For example, as long as GDP increases quicker than energy consumption, energy intensity will show a decrease. The policy implementation will then be seen as successful; however, we did not make too much effort on reducing energy usage" (CD03, 2015).

Hence, policy success can be achieved by pushing economic growth whilst performance in the initial policy domain might be comparatively poor. Additional cushioning effects might be related to the fact that Action-Checking performance does not compensate for weak achievements in energy reduction.

Apart from failing to capture 'bad' performance, the evaluation system also seems to fail to capture some 'good' performances, as the Yangzhou case clearly demonstrates. Yangzhou local government has undertaken great efforts in recent years to shift towards a sustainable energy system. They have implemented and launched different energy conservation actions and measures, such as frequent on-site research, capacity building with different relevant stakeholders to build local coalitions for a better embeddedness of actions, and improving social cohesion. These actions have resulted in considerable energy conservation measures in 2014 (YZ01, 2015), for example:

- 810,000 tce renewable energy, accounting for 7% of total energy consumption, which is above its provincial average (Jiangsu, 6.2%);
- 426MW PV capacity for solar energy: rooftop solar water heaters in the hospitality industry, public buildings, and residential buildings; installed solar lighting in public areas, saved 438.5 Mwh a year. Consequently, Yangzhou was approved by the State Council as the 'demonstration city of renewable energy application in buildings in China;
- Jiangsu's first large electric vehicle charging station was installed in Yangzhou, which now has a pure electric bus line and hybrid bus lines;
- 30 new energy communities have installed rooftop and wall-mounted solar water heaters, ground source heat pump cogeneration, electric vehicles, and garbage biogas. All of these efforts towards energy transition make Yangzhou a 'demonstration city of New Energy Use in China' (NEA, 2014).

The research illustrates that performance based actions are also conditioned by stronger economic power and capacity (e.g., funding), and a technological (e.g. cooperation and technological exchange) and knowledge-based background (e.g. expertise, tech-capacity (see also Guo, 2014)). However, those actions and measures are not assessed nor are they

well-recognised within the current conformance-based evaluation system: “What efforts we have made is hard to be demonstrated within the current evaluation system, because the numbers have the final say. But, we do hope our work can be noticed and thus we might get some financial or technological support from the central government” (YZ02, 2015).

In conclusion, our research shows that local governments have developed different response and coping strategies to achieve a successful policy performance on paper: different economic and political conditions, paired with individual career interests and facilitating energy intensity in order to measure actual energy reduction, indeed results in implementation deficiencies. It is also problematic for central government(s) to comprehensively examine how ably policy implementation is being carried out, especially as the ways in which these assigned targets are to be met can easily be neglected during policy evaluation. Consequently, negative aspects of implementation can be concealed whereas positive effects are hard to demonstrate. At this point we can conclude that the current TRS evaluation system is not only biased to conformance instead of performance, but is also unable to capture the great variety of performances in the cities studied.

2.6 Conclusions and policy implications

The Chinese government has drafted a broad variety of policies to reduce energy consumption, improve environmental quality and, in general, to stimulate a transition towards a more sustainable energy system. In being focused on ensuring effectiveness in local policy implementation, China relies on a top-down and compliance-oriented policy design and evaluation system. Although these top-down strategies have yielded several achievements over the last decade, the exclusive use of this approach also has drawbacks. We indeed found some similar coping mechanisms as also identified in earlier research (e.g., power rationing, data manipulation). What we add here are two key points. Firstly, we have been able to show that the Chinese energy efficiency policy framework’s strong conformance-oriented perspective can provoke a ‘ticking-of-the-boxes’ instead of promoting actual policy performance. Meeting a target on paper does not necessarily mean that it was actually met as both available data and how this data is interpreted remains open ended. Hence, deciding on conformance might well become more a matter of (political) choice and interpretation than that of showing evidence. Meeting targets can also be based on measures that cannot be safely assumed to contribute to improving energy intensity. They can be temporal or extreme, whilst economic GDP growth can be seen as a means to create better energy intensity figures as opposed to focusing on improved energy efficiency or actual conservation itself. In other words, a strongly compliance-oriented management only tells a very simplistic story and is not necessarily showing actual levels of performance.

Secondly, we add that failing to really take varying local circumstances into account is among the causes for lower levels of performance. In some cases, the Chinese energy efficiency

policy framework overlooks the hardships and extreme measures needed to meet targets (notably in Lanzhou and Hohhot). If conformance occurred, this might well be interpreted as a poor performance due to the extreme measures needed. Alternatively, not reaching targets is seen as a failure, even if the cities performed quite well but the set targets were simply unrealistic. In other cases, the Chinese energy efficiency policy framework overlooks relevant additional measures that could be taken to perform better or that are actually being taken (notably in Yangzhou). At present, the ill-adapted targets for local contexts might result in the underperformance of cities as they are not being sufficiently challenged by the targets or are not being awarded by successes attained.

Whilst some authors (e.g., Liu et al., 2012; Lo et al., 2015) do argue that conformance based targets need to increase in order to create the necessary push factor for local governments, we suggest that decision-makers should also embrace more flexibility and adaptiveness in both target setting and evaluation. Notably, such flexibility should account for differences between local circumstances and, by doing so, search for a better fit between strong top-down policy pressure and the type of actions and ambitions that are feasible given such local circumstances. In doing so, our cases illustrate the importance of a more balanced relationship between conformance and performance oriented targets so as to galvanise local authorities to perform in the initial sense of the policy. We are not calling for the flexibility to avoid or to legitimise not meeting targets. Instead, we are making a proposal for cities to act and to be judged on their actions. Valuing performance higher can encourage cities to act, even if goals are already met, and hence can create pressure to push cities' performances as far as can be locally considered feasible (e.g., Zuidema, 2017). Additionally, performance evaluation can also avoid mishandling data or taking extreme measures. It can instead promote local authorities to do that which really matters and is also acceptable to stakeholders for pursuing energy intensity reductions. Finally, the action-oriented focus of performance measuring can also be an incentive for cities to become 'action arenas' in which stakeholders are allowed, and even motivated, to experiment and pursue different projects and actions. In such arenas, learning-by-doing and capacity building can be triggered, while provincial and state governments may benefit by learning from local approaches and tested pilots. Within such a context, learning can show which ambitions or amount of state or provincial policy pressure make most sense to drive the performance of different localities as far as is reasonable. Hence, allowing for a more performance-oriented evaluation scheme could be instrumental in the process of developing a national policy framework that becomes increasingly smarter in pushing forward a Chinese.

3

Experimenting with decentralised energy governance in China: The case of New Energy Demonstration City Programme

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3 Experimenting with decentralised energy governance in China: The case of New Energy Demonstration City Programme

ABSTRACT

A transition from a fossil fuel based energy system to a more sustainable energy system based on renewables has been of increasing concern worldwide over the past decade. Such a transition has considerable spatial-physical and socioeconomic implications, suggesting area-based perspectives and related decentralised governance approaches as being crucial to complement, or partly replace, traditional centralised governance approaches. In response to implementation barriers to energy policies, China has also begun to experiment with more decentralised governance structures through the launch of national pilot programmes. In the meantime, international studies have disputed the widely assumed benefits of decentralised approaches. Scholars have especially cautioned that decentralisation needs to be informed about the degree to which local stakeholders are willing and able to cope with newly acquired responsibilities or tasks. The research here investigates the willingness and ability of Chinese local authorities to perform tasks indicated in the pilot programme 'New Energy Demonstration City (NEDC)'. This chapter examines four case study cities and over 20 expert interviews, noting only modest willingness and ability. Local performance is constrained by inadequate local technical and managerial ability and a possible weak profile of renewable energy compared to other local priorities, and a limited local scope of influence over energy transition-related challenges as well as decreased local willingness and ability. This chapter concludes that decentralisation under energy policies should take place within a context of central support and stimuli, highlighting the importance of national policies and regulations to enable and activate local authorities and stakeholders in pursuing energy transition policies.

KEY WORDS: Governance experimentation; New Energy Demonstration City Programme; Energy transition; China

3.1 Introduction

Energy transition has become a global political issue of some urgency and has attracted academic interest as a research subject in the fields of urban and environmental studies (Wassermann et al., 2015). An energy transition can be understood as a transformation of an energy system based on fossil fuels to one that is more efficient and is based on renewables. Such a transition is a highly dynamic, complex and multi-dimensional process in which one dominant socio-technical system transforms into another (Loorbach, 2007; Rotmans et al., 2001). This complex process is "not just a technological issue, but necessarily involves changes across the whole of a society" (Andrews-Speed, 2012, p. 63). More specifically, energy transition is a complex process that cannot be understood within isolated policy sectors. A multitude of interrelated processes are involved, including technological innovations, economic interests, institutions, rules, behaviours, etc. (Verbong and Loorbach, 2012). Hence, an energy transition involves a multitude of societal and market parties, each claiming their place in the governance process. In the meantime, these stakeholders have their own interests, aims, perceptions, and preferences which are interrelated and may conflict with one another (Droege, 2011). Moreover, policy development and implementation manifest themselves differently in different places due to unique local circumstances and interests (Smil, 2008). Therefore, relying on a centralised mode of governing is problematic for managing energy systems as this approach has difficulty in responding to interrelationships between energy systems and their physical and socioeconomic contexts in their unique local setting (De Boer and Zuidema, 2016). As a result, authors, such as De Boer and Zuidema (2015), have highlighted the necessity of area-based approaches to complement existing energy transition policies. In addition, authors, such as Kemp (2011) and Van der Schoor and Scholtens (2015), have suggested that the planning and governance of energy transitions needs to embrace and foster the roles that local government, entrepreneurs and citizens can play.

Arguments that support area-based planning approaches are closely linked to policy arguments that support decentralisation (Zuidema, 2017) which aim to shift power and responsibility from a national to a local level (De Vries, 2000). Proponents of decentralisation have argued that it can increase government responsiveness and effectiveness to local (and more complex societal) issues (Faguet, 2012), while also enabling more productive policy delivery, due to their being a greater knowledge of local circumstances (i.e. needs, potentials and problems) (De Roo et al., 2012). As such, local authorities are thought to be better placed to balance various local interests, power and resources among local actors, market parties, and social organisations (Rumbach, 2016). These widely assumed benefits have placed decentralised approaches at the center stage of policy experiments over the recent decades (e.g., Agrawal and Gupta, 2005; Bulkeley and Castan Broto, 2013; Zuidema, 2017). However, decentralisation can also have negative consequences (e.g., Flynn, 2000; Brinkerhoff and Azfar, 2010), for example, limited equity between local governments

promoting undesirable competition (De Vries, 2000), free rider problems and increased local corruption (Rees and Hossain, 2010). Meanwhile, authors, for example Smoke (2015), have stated that decentralisation can be risky, as decentralised units do not necessarily have the capacity and incentives to act as the theory predicts. As Zuidema and de Roo (2015, p. 65) argued, "decentralisation means that the outcomes of governance become increasingly dependent on local performance and therefore, of the available local willingness and ability to perform decentralised tasks and responsibilities." Benefits of area-based approaches and a more decentralised governance approach to energy transitions cannot simply be assumed, but need careful studying. This is exactly what this chapter will do, by targeting one of the most crucial countries in which a global energy transition needs to take place: China.

China is committed to an energy transition towards a low-carbon economy by setting up various policies and targets. Implementation barriers (e.g., Wu et al., 2017) and the expectation of boosting local energy transition have spurred China to experiment with local energy policies with pilot projects, such as Eco-City and Low-Carbon City (18th CCCPC, 2013). These national pilot projects allow local authorities to develop and implement policies according to their specific local circumstances to bring collaborating and competing stakeholders together in a local bargaining network (Li and de Jong, 2017). Although not a replacement for existing central governmental policies and targets, these pilot projects are intended to stimulate local policy formulation. As such, they represent an institutional attempt to experiment with more decentralised practices within the Chinese centralised planning system. Inspired by the aforementioned doubts about decentralisation, this chapter will investigate whether Chinese local authorities have the willingness and ability to develop and implement local energy policies.

Whilst contributing to our knowledge of the current development practices of Chinese energy policies, this chapter aims also to contribute to a wider debate on energy transitions and decentralised area-based working. Recent studies convincingly have showed the importance of studying energy transitions within their localised spatial contexts (De Waal and Stremke, 2014; Nadaï and van der Horst, 2010; Stoeglehner et al., 2011; Stremke, 2012; Zuidema and de Boer, 2017). The process and practices of the energy transition vary spatially due to the variety of stakeholders involved and the specific local circumstances (Faller, 2016). However, these studies have not explicitly addressed the role of more decentralised energy policies, and therefore this chapter is contributing to relate energy transitions with decentralisation in energy governance. Also, in China, the physical and socio-economic dependence of sustainable energy systems on the local landscape is barely even considered. If studies do address the local level, they have remained focused on the implementation of national policies in a local realm (e.g., Li et al., 2012; Liu et al., 2014; Yang and Li, 2013). Some studies have explicitly raised doubts about local performance (e.g., Khanna et al., 2014; Yu, 2014; Zhang et al., 2010). Nevertheless, these studies have not discussed precisely why local performance is poor, and they have hardly ever reflected on the possible role of the Chinese decentralised project-based approach (e.g., De Jong et al., 2016). As China works to engage more local energy policy development, this is not just an interesting empirical context

for analysing local willingness and ability, but is also relevant to develop Chinese energy policy. Hence, this chapter focuses on uncovering the potentials and pitfalls in relation to local willingness and ability to perform the most recent nationwide pilot programme: 'New Energy Demonstration City (NEDC).'

Arguments for and against decentralisation are discussed in Section 3.2 to inform the analytical lens used for the empirical study. Section 3.3 explains the methodology in which introduces the empirical context of the NEDC programme and the cities and is where this chapter studies its impact in practice. Section 3.4 discusses the results, noting the modest degree of willingness and ability to develop and implement energy policies at the local level. Main conclusions are presented in Section 3.5, where the role of central policies and incentives for stimulating and supporting local willingness and ability in the realm of energy governance are discussed.

3.2 Decentralisation in energy governance

An energy system can be viewed as "a complex web of interrelated actors and networks, in physical, social, economic and institutional senses" (De Boer and Zuidema, 2016, p.174). Transforming such a system, thus, involves not only considerable physical and socio-economic changes, but also a multitude of actors and parties with different interests (Verbong and Loorbach, 2012). Relying only on centralised governance modes dictated by governmental decisions and regulations has been viewed as being insufficient (e.g., Pierre and Peters, 2000; Wu et al., 2017). Instead, an energy transition requires a process of governance in which governments, markets and civil society are all involved across various levels and sectors (Loorbach, 2010).

Presently, Chinese energy policies rely on a centralised approach based on regulatory instruments. This is not without its problems, including serious implementation deficiencies at a local level (e.g., Wu et al., 2017). Inspired by a need to rethink the current hierarchal policy system (e.g., Gilley, 2012), the Chinese central government have chosen to experiment with more decentralised approaches in pilot programmes, such as the NEDC. The result is an increase in the inclusion of the local level in developing energy policies; this with the hope of boosting local policy development and area-based solutions. Scholars have pointed out that decentralisation can produce more balanced, inclusive and tailor-made policy solutions that are able to respond effectively to interrelated and complex issues (e.g., De Vries, 2000; Mosley, 2009). Nevertheless, the actual outcomes of decentralisation depend on local policy performance (e.g., De Vries, 2000; Werlin, 1992). As Zuidema (2017) suggested, local performance depends on local willingness and ability to take on decentralised tasks. Others have added to this that local willingness and ability cannot simply be assumed (e.g., De Vries, 2000; Flynn, 2000; Prud'homme, 1995). Instead, as, for example, Zuidema (2017) states, there are several key constraints to local willingness and ability (also Fleurke and

Hulst, 2006). Based on these findings, this chapter uses the concepts of 'willingness' and 'ability' to discuss the impact of the NEDC.

Understanding willingness

Although willingness seems to be a rather straightforward notion, there are at least two crucial nuances that need to be considered when analysing willingness at an organisational level. The first nuance is drawn from motivation-crowding theory and highlights the difference between willingness based on intrinsic versus extrinsic motivation (Rode et al., 2015; Ryan and Deci, 2000). Intrinsic motivation refers to doing an activity when driven primarily by self-interest or personal conviction (Ritz, 2015). Extrinsic motivation is when activities are driven by external pressure or incentives and are typically done for instrumental value, such as "in order to attain a separable outcome, be it of a material or monetary nature or related to perceived benefits of a non-material kind" (Rode et al., 2015, p. 270). The difference between intrinsic and extrinsic motivation is quite relevant in the case of decentralisation, as decreasing top-down pressure on local units will imply willingness to become increasingly dependent on intrinsic motivation (compare Bowles, 2008; Zuidema, 2017).

Accepting that motivation-crowding theory focuses largely on individuals fuels the second nuance. This does not imply that the difference between intrinsic and extrinsic motivation is irrelevant for organisational units, such as city governments (e.g., Ritz et al., 2016). Nevertheless, it is crucial to acknowledge that groups function differently from individuals. Organisational willingness might be influenced by existing organisational cultures and routine behaviour, constraining the flexibility to adopt new tasks. Furthermore, organisations consist of a multitude of individuals and organisational units. Thus, willingness might differ between units with, for example, one department being highly motivated to pursue certain policies, whilst others resist. In the context of urban governance, such differences might even be amplified, as the organisational environment also includes a multitude of organisations, including companies, citizen groups and lobby groups that all have some leverage on policy development and implementation (Stoker, 1998). In such a fragmented organisational context, identifying willingness needs to be sensitive to 'who' the group is that is willing and how it relates to others that might not.

Investigating local willingness in a context of decentralisation should also pay attention to the kind of tasks and government functions that are decentralised (e.g., Fleurke and Hulst, 2006; Prud'homme, 1995). Local units need to perceive tangible benefits when performing such tasks. These can range from financial or economic benefits (extrinsic motivation), to social welfare creation, or even have advantages gained from an ideological or societal value-driven perspective (intrinsic motivation). While energy might well be relevant for all these benefits (e.g., De Boer and Zuidema, 2016), energy also runs a risk of being an issue not directly appreciated as being urgent in a local realm. Zuidema (2017) discussed a similar problem regarding environmental policies in a local realm where he identified this as having

a relatively *weak profile*. Some of his examples are also applicable when discussing energy. The benefits of renewable energy are also partly invisible and less tangible (as with global climate change and air pollution). Renewable energy is also facing technological uncertainty (Andrews-Speed, 2012) while an energy transition will require tremendous investments. Apart from the costs of adding renewable production capacity, many changes are also needed to the many cables, wires, installations or even machinery relying on fossil fuels (e.g. cars, heating systems, housing, shipping, etc.). Even though recent studies have shown that previously high capital cost of renewable energy production have an increased decline and more economic potentials start to emerge (e.g., solar and wind) (Pfenninger et al., 2014), economic challenges thus still remain. Long-lead times and high initial investments needed for the planning and construction of more sustainable energy systems can be competing with the pursuit of short-term economic rewards (Scrase and MacKerron, 2009). In addition, institutional barriers in energy transition still remain with routines and regulations favoring existing fossil fuel based practices remaining relevant (Pinkse and Groot, 2015). So, while renewable energy is clearly gaining a stronger profile with regards to its social and economic prospects, it remains realistic that renewable energy ambitions can be eclipsed by priorities that are easier to recognise as being economically attractive policy objectives on local government policy agendas (Andrews-Speed, 2012). Hence, local authorities might be reluctant to deal with the energy transition unless, at least, external incentives are present (e.g., rewards, pressure and prods). Even if there is intrinsic motivation, it is probably still challenging to balance sustainable energy with other policy priorities, as other motives and interests also compete for budget and effort within the wider urban governance arena (e.g., GDP growth, housing and environment). That is, even if fractions of the urban government and society do experience an intrinsic motivation, it is all but evident that the wider urban governance agenda is susceptible to sustainable energy ambitions. Therefore, these risks of renewable energy ambitions are crucial to take into account in empirical analysis.

Understanding ability

Ability, first of all, relates to the qualities and characteristics of the local units that have to perform decentralised functions. Prud'homme (1995) highlighted that local units cannot simply be assumed to be equipped with the technical and managerial expertise required to perform a decentralised task. Zuidema (2017) added to this that, next to access to sufficient quantity and quality of staff members, access to relevant tools and technologies (ICT based, computer models, monitoring tools, etc.) are also needed. Furthermore, allowing local units to invest in, for example, new technologies and equipment, research and development, hiring consultants or attracting new staff can compensate for when abilities are constrained by poor access to financial resources.

In practice, there are often important 'economies of scale' associated with many tasks, where larger (central) government units might have a greater ability in attracting competent staff, for investing in research or for attracting required resources to handle arising and broad ranging policy issues (Prud'homme, 1995; Zuidema, 2017). Hence, there are doubts as to

whether smaller (local) units can be sufficiently equipped with equivalent abilities as central governments (e.g., Prud'homme, 1995; Segal, 1997). Economies of scale might be less relevant in this research, as case study cities in a Chinese context often have in excess of one million inhabitants, while the arguments in the literature on decentralisation have tended to discuss units (much) smaller than that. Nevertheless, it is also well-documented that (large) cities in China do face common problems, such as inadequate technical resources, unqualified staff (also Gilbert et al., 2013). Hence, as Ostrom (2015) suggested, the central government should support local authorities to overcome potential constraints by supporting their basic needs, conditions and facilities so as to better engage in decentralised policy design. Therefore, when investigating ability, it is crucial to understand how it is influenced by central government support, which, in our case, implies the NEDC policy framework.

The ability to deliver might also be constrained as a transition towards a low-carbon energy system involves several competences that can be highly challenging to (local) governments, amplifying the possible impact of economies of scale. The ongoing transition requires new ways of thinking, working and operating, for example: new technical designs, components and practices to adapt to the new socioeconomic system (Andrews-Speed, 2012). During this transition process, new technologies need to upscale and be embedded in space, grids and businesses. Thus, local authorities need to equip themselves with the *technical abilities* to tackle this challenge. However, transforming the energy system is not merely restricted to developing and replacing technology. Changes in social and institutional rules, like new policies, new relationships between different actors and various domains, and new organisational structures between departments and within the energy industry, are also needed (Moss et al., 2015). Therefore, this requires an integrated approach that can link cross-sectoral interests, priorities, ideas and the formation of partnership with key stakeholders. Hence, *managerial abilities* are also needed, supported by, for example, professional training systems and collaborations with companies or civil society.

Scope of influence

Willingness and ability should not be rigorously separated. After all, when willingness is strongly fragmented in urban governance, there are also practical constraints in being able to govern successfully. A crucial interrelationship between willingness and ability comes forward in what Prud'homme (1995) called 'external effects' and that Zuidema (2017) related to the 'scope of influence'. Both are relevant in the case of energy policies; most notably as it involves issues that manifest on multiple spatial scales. This multi-scalar character tends to result in a limited local sphere of influence over such issues (Ostrom, 2015). This means that local authorities have no or little impact on such issues, since the "decisions of adjacent municipalities or higher-level authorities are also relevant" (Zuidema, 2011, p.118). To illustrate the point in distributed power generation, state-owned enterprises are reluctant to accept major adjustments to the operation of electricity networks in order to maintain their powerful positions in the prevailing market paradigm (Sauter and Bauknecht, 2009). Local new (or small) power enterprises, therefore, are, either shunted

from entering the market, or face price competition with large state-owned companies (e.g., Xingang et al., 2012). Decentralisation now becomes risky, since all these potential problems can undermine local willingness and ability. An individual local unit alone cannot solve such problems, while the regional, or even national, cooperation is desirable. Thus, investigating willingness and ability again begs for the attention of central policies and cross-jurisdictional coordination.

3.3 Methodology

This study follows a qualitative case study approach, choosing the *New Energy Demonstration City (NEDC)* programme as its case, which is introduced in this section. The programme provides a context to explore local authorities' willingness and ability in developing decentralised energy policies. To better identify the specific local responses to NEDC programme, also four cities within the NEDC were studied in detail. The case selection is presented in this section, as well as the process of data collection and analysis.

Introduction to case programme: New Energy Demonstration City (NEDC)

The NEDC programme is the most recently launched programme. It operates within a broad variety of different city and development programmes that have been introduced by different Chinese ministries, such as *Eco-City (2003), Low Carbon Eco-City (2009) and Low-Carbon City (2010)*. Their common goal has been to improve urban development by incorporating ecological and environmental (e.g., energy) in policy making and implementation. Evaluation of these programmes has illustrated that rather broad and fuzzy visions were translated insufficiently into policies and resulted in modest policy success on a local level (e.g., Khanna et al., 2014; Liu et al., 2014). The NEDC programme aims to establish more tangible targets, focused directly on the development of local projects in the field or renewables to instigate and support the shift a sustainable urban energy system. The development of a decentralised energy system and the implementation of renewables-based technologies are important foci of the programme.

The NEDC programme was implemented by the National Energy Bureau (NEB) in 2012 (NEB, 2012), related to the *12th Five-Year-Plan Renewable Energy Development* (NDRC, 2012), which programmed the implementation of 100 New-Energy-Demonstration-Cities until 2015. Those cities were meant to become examples of good practice for other Chinese cities. Local authorities are expected independently to take the decisions and responsibilities for NEDC programme implementation. However, the state assumes that decentralisation will facilitate better local authorities' responses to locally embedded issues, resulting in more favorable policy outcomes. The NEB encouraged local authorities to volunteer in the programme. They especially targeted municipalities with high potential (e.g., natural resources) and ambitions

for participation. Local authorities responded well, due to their prior experiences where volunteering in comparable programmes was incentivised by additional national funding, tax benefits, subsidies, programme investments, and external cooperation (China low-carbon city construction report, 2014). The plans submitted for the selection committee had expected these to be customised to local circumstances, illustrating innovative strategies. However, previous studies for similar programmes illustrated (e.g., De Jong et al., 2016) that developed strategies and implementation actions are often too optimistic about their expected impacts, they over-rate organisational capacities for developing and implementing plans, and they are often very impractical.

In 2014, 81 cities and eight industrial parks were selected and approved based on the following criteria: (1) by 2012 their share of renewables was more than 3% of total energy consumption; (2) the ratio should have risen to a minimum threshold level of 6% by 2015 (NEB, 2012); and (3) they already showed progress in energy saving and environmental protection, i.e. municipal energy consumption per unit industrial value-added was below the provincial average (NEB, 2014). Initial audits and monitoring showed that "…most cities are having difficulties and low motivation in performing the NEDC programme, resulting in an overall very slow rate of progress" (Study of capacity building of new energy demonstration cities, 2016, p.17).

Case study cities

Four case study cities were selected to cover diverse urban conditions, such as geographical location, availability of different natural resources and energy resources, population size and economic performance (Fig. 3.1). A diverse sample allows the investigation of a broad range of different responses to the NEDC programme.

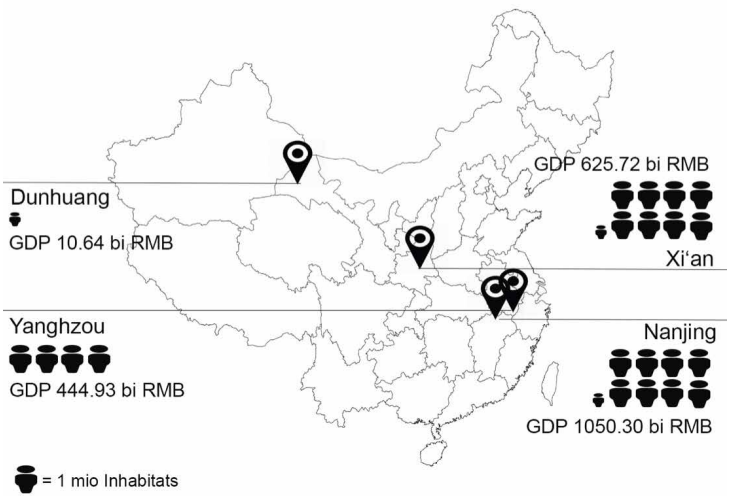


Figure 3.1 Location of the four case studies (*Source:* Authors)

Note: GDP is based on the year 2016

The two cities on the east coast are economically strong and well developed with active markets, a strong technical workforce, rich talent pools, and advanced ideas of urban development (China statistical yearbook for regional economy, 2016). Due to their economic strengths, they were expected to be well equipped with resources and have a higher ability to perform. In addition, Yangzhou was specifically interesting, as it has shown increasing interest and ambition regarding renewable energy and already has implemented a diverse range of sustainable energy initiatives and projects. The selection of these two cities was based on the assumption that, if such economically well-performing cities are facing challenges regarding their ability, one might consider the challenges other cities are facing are even more grand.

Dunhuang is a small city in northwest China in Gansu province, rich in mineral resources, petrochemicals and electricity generation. Dunhuang is one of the richest areas in China for solar energy, enjoying approximately 3,258 sunshine hours per year and 75% sunshine percentage. Geomorphologically, the surrounding Gobi Desert provides excellent conditions for solar power generation, putting Dunhuang in a frontrunner position for PV and applications (ADB, 2014). Despite its abundant natural resources, economically, the city is one of the least developed Chinese regions. Dunhuang represents an opportunity to investigate how resource rich, but economically weak localities respond to the NEDC programme. Xi'an is located in the Guanzhong plains in northwestern China with an average economic strength, focusing on manufacturing industries and services. It invests in high tech industries, research and development activities. Xi'an, along with Chongqing and Chengdu, belong to the Western Triangle Economic Zone (the three cities comprised a 40% share of Western China's GDP already in 2009), which is expected to be a major driver for future growth, especially in the high-tech industry (The China Perspective, 2017).

Data collection

The empirical work is based on an in-depth document and policy analysis drawn from various Chinese research report[3]. This analysis provided the basis for the 28 semi-structured interviews conducted in the four city cases between December 2015 and January 2016: Dunhuang (5 interviews), Xi'an (5), Yangzhou (6), and Nanjing (6). The interviewees include journalists, scholars, project managers of energy enterprises, and government officials from different levels of government and different departments related to energy projects: such as planning, economy and environmental protection. Six additional interviews were conducted with representatives from the central government, the National Renewable Energy Research Institute and the Chinese Academy of Social Science in Beijing. Table 3.1 shows the interview questions. Qualitative data from the interviews were analysed using content analysis techniques (Krippendorff, 2012).

3 China renewable energy industry development report, 2014; China low-carbon city construction report, 2014; and Study of the capacity building of new energy demonstration cities in China, 2016.

Table 3.1 Analytical framework, translated into the guideline interviews

Potential constraint	Guiding questions
Willingness	• What is the driving force of applying for the programme? (intrinsic and extrinsic motivation) • How important are energy issues as compared to other local policy priorities (e.g., GDP growth, environment)? • How is willingness spread among departments and stakeholders?
Technical and managerial ability	a) Technical ability • Do you consider your city has sufficient technical expertise? • Are there funding and subsidies available to support the implementation ofNEDC programme? • How does your city attract needed expertise from different fields? • Are there other supportive polices in your city? b) Managerial ability • Do you consider your city has sufficient managerial expertise to develop and implement energy plans and projects? • Are there training systems in place? • What instruments/tools are used to discuss and balance interests with stakeholders?
Scope of influence	• What struggles are encountered that local authorities can hardly influence?

3.4 Findings and discussion

Limited willingness: a weak profile revealed

In evaluating the NEDC, Runqing (2015) pointed out the slow development of the programme. The interviews confirmed this picture and especially the frustration regarding the expected external incentives and benefits: "(...) by far we have not yet received any financial allocation, tax benefits or rewards policies from the central government" (NJ03, 2016). The NEDC triggered and motivated local authorities and stakeholders with the promise of financial incentives. Prior experiences with comparable programmes that were heavily incentivised (e.g., Low-Carbon City) amplified the expectations and the extrinsic stimulus to participate (BJ03, 2015). The missing external stimulus now undermines the local willingness of NEDC implementation. Consequently, intrinsic motivation has become dominant, which, in practice, was often limited to using the NEDC label merely to add to city branding to attract external investors and companies (BJ02, 2015). This phenomenon, in particular, happened in larger cities, such as Nanjing and Xi'an: "The energy transition itself actually holds little attractions for us, since it can only contribute a small proportion to local GDP" (NJ04, 2016). This might be due to the Chinese so-called GDP-ism, where GDP growth is the overriding policy goal (Table 3.2). This corresponds with earlier research results (Jia et al., 2015). Under

high political pressure, local authorities prioritise policy targets and measures that can propel economic development. Additionally, governing the energy transition is a long-term pursuit, which sometimes conflicts with short-term priorities, e.g., GDP improvement. The NEDC programme, as part of this transitional aim, requires significant investment but "(…) has a long payback period and unstable earnings" (XA03, 2015). The weak profile of sustainable energy ambitions indeed undermines intrinsic motivations. Combined with the non-appearance of external benefits, the NEDC has become mere 'window dressing' with minor impacts. This outcome also resonates with work from Gneezy et al. (2011) who showed that low or insufficient extrinsic incentives could lower the willingness and increase the risk of implementation deficiencies.

Table 3.2 Overview of mapped local willingness and ability to NEDC implementation

Indicators	Details	Dun-huang	Xi'an	Nanjing	Yang-zhou
Willingness	Extrinsic motivation dominant	×	√	√	√
	Serious degree of intrinsic motivation	√	×	×	√
	Urban wide willingness (as opposed to limited to small group of actors / depart-ments)	√	×	×	×
	Energy transition is considered as a crucial policy issue, compared to the importance of GDP as policy priority	×	×	×	×
Technical and managerial ability	**Technical ability**				
	Sufficient expertise	×	×	×	×
	Special funding and subsidies	×	×	√	√
	Talent attracts policy	×	√	√	√
	Other supportive polices (e.g., projects subsidies, rewards, legal instrument)	×	√	√	√
	Managerial ability				
	Sufficient expertise; notably integrated approaches and working across depart-mental and governmental organisational borders	×	×	×	×
	Training system	×	×	×	×
	Tools setting to discuss and balance interest among stakeholders	×	×	×	×
Scope of influence	Mismatch between spatial and administrative scales	√	√	√	√

Source: Interviews 2015/2016

Compared to Xi'an and Nanjing, Dunhuang and Yangzhou showed more intrinsic motivation for NEDC implementation. In Dunhuang pushing for renewable energy is even a citywide mission, supported by considering it a key economic opportunity for the city. With Dunhuang thus shown the rise of renewable energy as a possible opportunity to support GDP growth, the other cities were different. Even in Yangzhou renewable energy was largely limited to the energy department. The Yangzhou energy department's stated vision is to improve the livability and sustainability of the city as a result of the energy transition, and considered the NEDC programme as a welcome opportunity to realise this vision (YZ02/03, 2016). However, the size of the group and enforcement power hampered their possibility to push the agenda, design and implement projects and, therefore, they missed the reinforcement, internal satisfaction and social recognition (Rode et al., 2015) for their efforts to implement the NEDC programme. For example, the energy department of Yangzhou suggested renewables were integrated into old communities and new buildings, which was also drafted in its NEDC plan (Table 3.3). However, this planned measure encountered limited support from other related governmental sectors, such as the housing department: "We are reluctant to shoulder the retrofit costs alone, which can also be an extra administration burden for us" (YZ05, 2016). Similarly, as respondents in the economic department stated, "sustainable energy could not bring us immediate economic growth, along with nothing in financial support…this issue is then hard to be taken seriously" (YZ01,2016). Conflicts of interests and alternative policy priorities constrained overall local willingness for pursuing NEDC ambitions.

Table 3.3 Key measures and targets in the four case study NEDC plans

City	Targets (share of renewables in energy consumption)	Key planned measures
Dunhuang	27%	• Micro Grid project:11,640kw • Concentrating solar power (CSP) and combined heat and power (CHP): 145mw • Solar PV and wind power generation: 3000mw • Solar hot water project: 10,000m2 • Solar house project: 14,000m2 • Electric vehicle project (EV): 430 vehicles
Xi'an	6.4%	• Solar hot water and wind power generation projects • Solar water heater systems and solar lighting in new developing areas • Develop biomass power generation projects in urban and rural areas
Nanjing* (Jiangning district)	6%	• Solar PV: 50mw • Waste power generation project: 44mw • Biomass power: annual generating capacity reaching 30 million kwh • Wind power: 100mw wind farm • EV: 2 EV bus charging stands;1400sm battery charging stations

Yanghzou	8%	• Promote solar water heater systems in existing buildings • Integrated renewable energy (RE) in historical old towns • Geothermal application in residential communities and all new public buildings • Develop 30 integrated RE community demonstration: installing rooftop and wall-mounted solar water heaters, ground source heat pump cogeneration, solar PV, garbage biogas, etc. • 'Smart valley' demonstration base: RE application education and training bases to show major RE use projects

*: Nanjing municipality selects Jiangning district as the pilot area for NEDC project

Source: Fieldwork; NEB (2012)

The cases suggest that relying on intrinsic motivation alone currently might not be sufficient for pushing forward urban renewable energy initiatives. Even among the participants of the NEDC, the role of assumed (financial) benefits dominated over intrinsic motivation. Facing no such benefits, only two cities show evidence for motivation, while in Yangzhou, this motivation is limited to merely the energy department. With these cities likely being amongst the more proactive cities, it is unlikely the overall picture of motivations for renewable energy projects is larger in the majority of Chinese cities. Hence, even when decentralised working can add value, the results suggest that a degree of top-down pressure does remain crucial to create sufficient extrinsic motivation.

Technical and managerial ability

Although all four cities' plans are in the NEDC application phase with ambitious targets and measures (Table 3.3), all lacked ideas about how exactly to implement these plans. They not only have difficulties translating strategic ambitions into practical tools and projects, but also experience difficulties integrating energy ambitions into local sectoral plans. The respondents pointed out that an energy transition requires many new competences, such as cross-sectoral working, designing long-term policy, reorganising governance structures, creating new institutions, new technological skills and substantive expertise. They all considered themselves ill equipped to address these challenges, lacking 'sufficient expertise' (Table 3.2). Notably, the respondents noted problems of limited staff, resources, and expertise, causing local authorities to often struggle with programme implementation. The eastern, and thus richer cities (i.e. Nanjing and Yangzhou), did show a stronger ability regarding, for example, talent attraction and funding (see Table 3.2). Nevertheless, even these cities considered themselves to be only partly equipped, at most. Nanjing and Yangzhou still reported that their managerial and organisational abilities were too modest to fully develop cross-sectoral and integrated approaches and to forge convincing and sustainable partnerships with involved stakeholders. In doing so, several local representatives also referred to their relative small capacity to attract funds and expertise, as compared with the central government; indeed suggesting economies of scale mattered even for these larger local units.

The western cities faced the most severe problems. A national expert indicated, "ideas and behavioural patterns in western cities still remain in the era of planned economy. They used to expect and wait until the central government tells them what and how to do. It seems very difficult for them to link actively local energy resources to the policymaking of urban development" (BJ01, 2015). For example, respondents in Xi'an perceived that they found it hard to find sufficient quantity and qualified expertise in the design of NEDC plan. Instead, policy-making relied largely on a few implementing governmental officials (XA05, 2016). Next to finding limited technical experts, Xi'an also complained about limited skills in integrated working:

> "We have not found qualified staff that can help us make plans in an integrated way, considering energy transition in other social aspects (e.g., environment, economy). We once tried to cooperate with local universities and research institutes, but mostly are focusing on technology use at a given renewable energy resource (e.g., solar, wind or biomass) instead of thinking in a holistic and comprehensive way. We do not believe that making the project successful can only rely on exploration by a few of us sitting in government offices" (XA01, 2016).

Severe problems were also encountered in Dunhuang. As a resource-rich, but economically weak city, the municipality viewed NEDC as a city mission and an opportunity to expand its already limited economic development channels. Therefore, Dunhuang established a management office to act as the implementing agency specifically for NEDC programme. However, its high willingness could not guarantee the take off and Dunhuang noted severe constraints in technical and managerial expertise. Additionally, there were no distinct policies in place to hire specialists and to invest in research funding for NEDC. These findings align with the ADB report, "Gansu Province showed strong interest in the timely implementation of the programme in its selected cities of Dunhuang…but highlighted capacity gaps in implementing the programme" (ADB, 2014, p. 3). Clearly, with even the richer eastern cities being constrained, success of the NEDC also would depend on national government support in the form of, for example, staff, funding, training or expertise. Again, decentralisation should not be seen in isolation from central governmental roles and responsibilities.

Scope of influence

Finally, all four cities face serious renewable energy (RE) challenges that are beyond their scope of influence (Table 3.2). One problematic example is the RE power grid integration issue. Although the power sector reform in China has been ongoing for several years, the current power market is still deeply rooted in the planned economy and administrative monopolisation (Kahrl et al., 2011). While the market for power generation is open to the private sector, the power grid is state-owned and holds a monopoly on transmission, distribution and supply of electricity, i.e. controlled electricity purchase and sale. The State Grid Corporation owns and controls 88% of the regional and inter-regional transmission lines

in China (China's energy system reform report, 2014) and grid feed for private companies is limited and subject to state control.

Also, the central government sets energy prices. Thus, even if cities implement projects and increase their RE share, the possibilities for further development can be limited due to restricted grid access: "Local private, especially small, renewable energy companies barely have room to negotiate with the state-owned grid companies regarding grid integration, while we municipalities do not have the right to make any reforms to the current power system" (NJ01, 2015). A project manager in an energy enterprise remarked that, "Energy companies in China now failing to connect to the grid are nearly all local private companies" (BJ05, 2016). Hence, energy project investors and developers are gradually losing their enthusiasm and willingness to fulfill the project implementation: "… (the) Chinese power sector does need a reform" (XA02, 2016), and "Open the power market and allow the sale of electricity to the private sector, and formulate market-oriented energy pricing systems" (YZ04, 2016).

Failure to integrate RE into grids further hinders an energy transition: Western Chinese cities are experiencing high levels of renewables curtailment. A nationwide report revealed "(…) there was more than 30% of wind power and solar power curtailment in Gansu Province and Xinjiang Autonomous Region in 2015, even more than 50% in some months" (CREO, 2016, p. 30). The implication here is that many power producers, such as solar panels and wind turbines, stop generating power even when they can, thereby resulting in huge renewable resources being largely wasted. This is notably problematic in Dunhuang, which produces excess energy due to its low self-consumption, but high RE energy production. Therefore, it is pinning its hope on transmitting its redundant electricity to other Chinese areas with high electricity demand, such as cities in the east. However, these cities prefer local fossil-fuel power, or their own renewable potential, rather than to purchase from trans-regional markets in consideration of local economic benefits and in support of their own RE companies.

This creates additional issues that are outside of their local scope of influence: (1) for Chinese local governments, fossil-fuel generation is still the primary source of tax revenues and employment; (2) RE power has no price advantage, as China's RE price is set by central government and is close to the fossil-fuel price, but it rises once REs are transmitted to other electricity demand regions (transmission costs are counted); and (3) Chinese central government still maintains guaranteed quotas for fossil-fuel electricity generation, the priority source of generation. Meanwhile, there are no mandatory quota regulations on regional grids to integrate RE electricity, leaving RE struggling to compete. "We feel anxious that our mass renewables production struggles to be transmitted to the outside and thus are wasted," (DH03, 2015) was one concern voiced in Dunhuang. Clearly, a larger, and even national level, reform of policies on Chinese power sector would be needed to boost local willingness and ability.

3.5 Conclusions

In the face of failures to implement some previous national energy policies, the choice of the Chinese national government to experiment with more decentralised working seems both relevant and promising. Notably, in urban contexts where the spatial implications of renewable energy are both vast and easily contested, such decentralised working might be crucial in negotiating possible societal resistance and activating local (economic) spin-offs. But, while area-based and decentralised working both seem sensible, if not crucial, local willingness and ability are not evident. Local performance is strongly constrained by inadequate local resources and abilities, and meanwhile, except for the case of Dunhuang, renewable energy does not face much local willingness. Despite its rapid increase in popularity a raising financial benefits, renewable energy does not yet show itself to be a mainstream policy priority. Even if it does, as in the case of Dunhuang, the wider national institutional setting and the limited scope of local influence still frustrates a rapid take-up of renewable energy. Renewable energy might be gaining a much stronger profile, but our study suggests it is currently not yet strong enough to capture the full attention and support of local authorities. Thus, integrating more local policy development and implementation in the energy transition should not ignore the role of (inter) national policies to enable and activate local authorities and stakeholders in pursuing energy transition policies (also De Vries 2000; Prud'homme, 1995; Zuidema, 2017).

For the NEDC, only limited national support existed. There were no supportive and external stimuli in place to motivate local willingness. This suggests that future success would demand such incentives, for example, financial resources or flexible regulatory pressure. Currently, the pilot projects run a serious risk of becoming mere campaign slogans. These could also ask for performance-monitoring mechanisms, or more binding contracts or covenants between central government and municipalities participating in programmes, such as the NEDC. Rewards and pressure, in combination with monitoring local performance, can incentivise local action and promote cooperation between various organisational units.

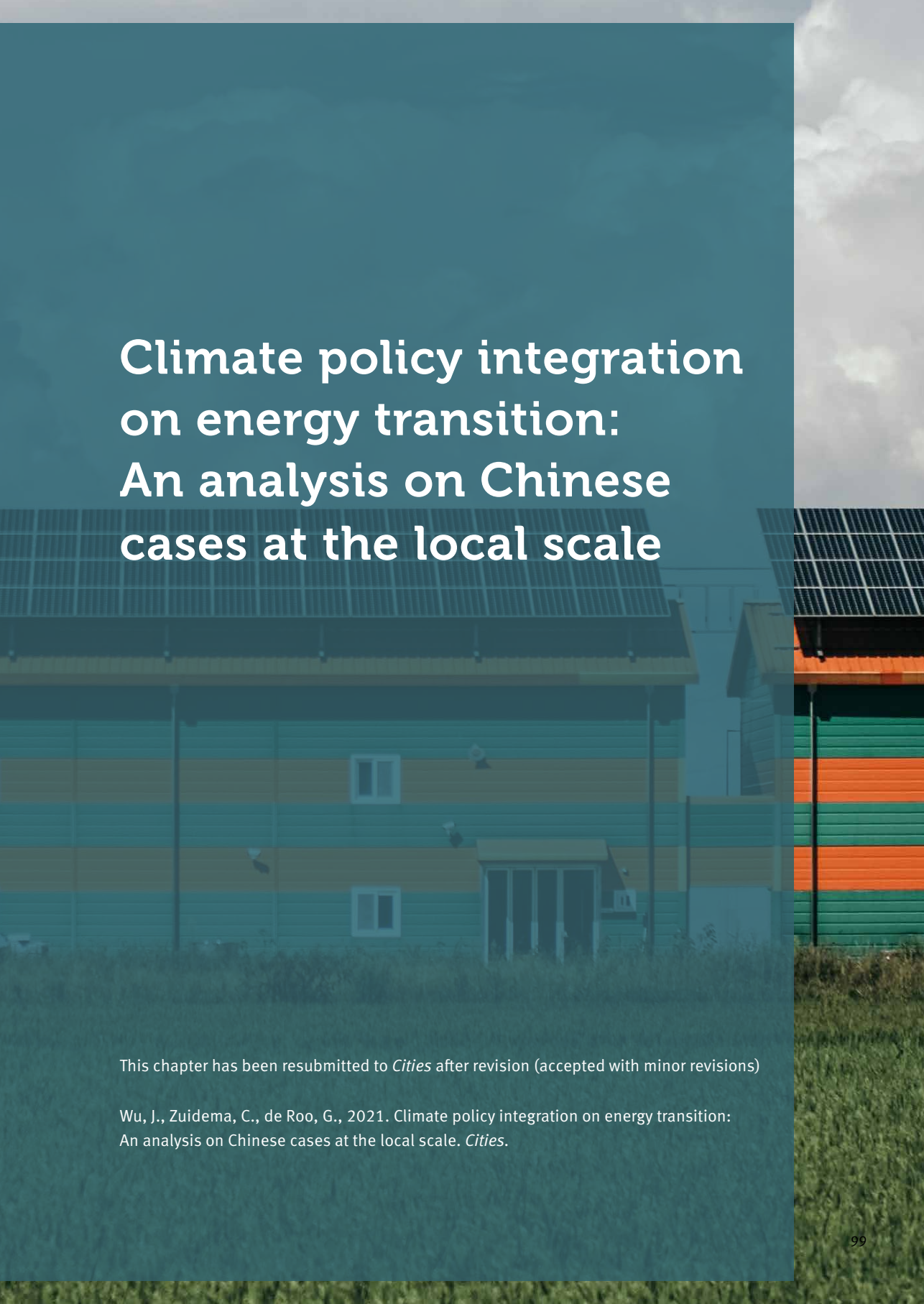
Apart from putting pressure on willingness, the limited technical and managerial expertise seems even more urgent. While the literature on decentralisation warns about economies of scale for smaller local units, the current pursuit of energy transitions puts even larger local units at risk. The size and complexity of such a transition, combined with novel technological skills, seem to be too grand for even cities of eight million inhabitants. Apart from suggesting some degree of national support, the situation also clearly illustrates how ill-equipped many current governance systems still are in the face of the physical, economic and institutional challenges of a significant energy transition.

Nevertheless, some degree of central government support could alleviate the challenges. They can help local authorities (especially smaller/western cities like Dunhuang) through

guidance, training and offer them expertise, ideas and experience to deal with new tasks. Moreover, central government can balance regional differences through its national administrative capacities; for example, by allocating talent resources from eastern Chinese cities to western cities for a period to provide much-needed professional and advanced ideas and knowledge. Furthermore, it is necessary for the central government to set up effective regulatory frameworks to drive and enable RE development and electricity market reform. Doing so could spur local private energy companies and related stakeholders to get involved in the Chinese energy transition.

Finally, it is important to note that this research findings might be based only on the Chinese situation, but that they explicitly resonate with existing international research findings and debates on decentralisation. This suggests that this research findings might well be more widely applicable if not simply evidence of some fundamental characteristic of decentralisation: local willingness and ability to take over decentralised responsibilities and tasks can easily be constrained and lacking. As such, this research findings serve as a clear warning for alternative policy contexts where more decentralised working is sought after within the energy transition. Technical and managerial ability, the possible weak profile of energy vis-à-vis other local (financial) priorities and a limited local scope of influence over crucial causes of existing challenges simply need to be assessed and addressed before and while pursuing decentralisation. In the meantime, this research also confirmed that when celebrating the importance of local initiative and involvement in energy transitions through area-based working, there remains a critical need for national policies and regulations; not only as some issues are simply better dealt with at a higher level, but also to enable, support and stimulate local action and area-based solutions. After all, local willingness and ability cannot simply be assumed, certainly not when it comes to the NEDC.

4



Climate policy integration on energy transition: An analysis on Chinese cases at the local scale

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4 Climate policy integration on energy transition: An analysis on Chinese cases at the local

ABSTRACT

International concerns about climate change and environmental and socio-economic impacts linked to fossil fuels have pushed energy transition up the agenda of the Chinese central government. The Chinese central government recognises that energy transition requires actions beyond what the energy sector can deliver, and has thus called for policy integration. Climate policy integration has emerged as one of the key strategies to respond to energy concerns by incorporating the diverse perspectives of various sectors. The main goal is for energy issues be considered and governed by multiple sectors taking collective responsibility and allocating resources for similar policy ambitions. However, developing integrated policy within traditional hierarchical sectoral settings can be rather challenging. In this chapter, we analyse how the integration of energy ambitions within non-energy sectors manifests at local level in urban China. This research draws upon semi-structured interviews in two case study cities: Chengdu and Yangzhou. We find generally weak climate policy integration in local governments due to insufficient communication and interaction between policy sectors, limited professional capacity, and inefficient governance structures. These findings suggest incorporating hierarchical, top-down governance with an increase in cross-sectoral and horizontal forms of communication and interaction, as both actions can significantly facilitate policy integration.

KEY WORDS: Energy transition; Policy integration; Urban planning; Governance; Urban China

4.1 Introduction

Tackling climate change and transitioning towards low-carbon city development are among the main policy ambitions in China. The central government of China pursues this ambition by promoting the integration of national low-carbon policies into all relevant policy domains, including economy, transport, environment, and industry. Such policy integration was enshrined in the recent 12th (2011) and 13th (2016) Five-Year-Plans, with clear legal obligations, and was further punctuated by the New Urbanisation Plan (2014-2020) (State Council, 2014). Importantly, international concerns about climate change and persistent high levels of air pollution in China, notably from fossil fuel combustion, have raised energy transition high on the agenda of the Chinese central government; in response, it is pursuing its 2020 low-carbon targets by highlighting energy transition policies. Notably, China aims to upscale its share of renewable energy to 15%, and reduce CO_2 emissions per unit of GDP by 18% relative to 2015 levels (NDRC, 2016). To achieve these ambitious objectives, the Chinese government recognises that actions must exceed what the energy policy sector can deliver and hence, require a degree of policy integration.

Energy transition is a complex cross-cutting process in which a socio-technical system transforms from one state, fossil-fuel based, into another renewables-based state with efficient energy use (Loorbach, 2007; Droege, 2011). The system shift of energy is a combined process of physical, technical, socioeconomic, and institutional changes which are embedded across a number of sectors, such as housing, transport and industry (Basu et al., 2019; De Boer and Zuidema, 2015; Wu et al., 2018). Given the complex cross-sectoral nature of energy transition, it is necessary to harmonise energy ambitions into other sectoral policies to promote a coherent and integrated approach. This is explicitly acknowledged in the Chinese Urban Adaptation to Climate Change Action Plan (2016): "Climate change adaptation and mitigation, especially energy objectives, should be integrated into all related sectors and policy areas (e.g., transport, spatial, economic, and building) to achieve a sustainable and low-carbon future" (State Council, 2016).

Policy integration means dealing with cross-cutting policy issues by supporting an integrated and holistic policy strategy, and taking account of diverse sectoral values and perspectives (Briassoulis, 2005; Park and Youn, 2017). In doing so, policy integration can help to avoid conflicts, contradictions and redundancy between policy sectors to facilitate reaching overall governmental policy goals (Stead and Meijers, 2009). Briassoulis (2005) describes it as "a process of incorporating certain concerns (e.g., environmental, social and economic) into an extant policy to produce an integrated policy" (p. 50). Integrating climate (including energy) objectives into other sectoral policies is referred to as 'Climate Policy Integration' (Rietig, 2013). Specifically, climate policy integration is defined as "the incorporation of the aims of climate change mitigation and adaptation into all stages of policy making in other policy sectors" and "a commitment to minimise contradictions between climate policies and other

policies" (Mickwitz et al., 2009, p. 19). Climate policy integration is based on the concept of Environmental Policy Integration, and is seen as one of the key policy strategies to respond to heightened concerns about climate change and the promotion of energy transition (Adelle and Russel, 2013). With integrated approaches, cross-cutting problems are considered and governed by multiple sectors that collectively take responsibility and allocate resources and instruments to pursue a similar policy ambition (e.g., energy transition).

It is well established that the local level can play an important role in the pursuit of policy integration, which also applies to climate policy integration. Policy integration targets the development of coherent and holistic policy approaches for addressing interrelated policy issues (e.g., energy or environmental issues). Often such interrelated issues have time and place specific manifestations; i.e. where causes, effects, interests, and exact manifestations depend on unique local cirucmstances (e.g., Jordan, 1999; Liefferink et al., 2002; Zuidema, 2017). The large spatial implications of pursuing renewables and energy efficiency further strengthen the need to adapt (national) energy policies to specific local circumstances (e.g., De Boer and Zuidema, 2015). Central governments have difficulties in responding to specific local circumstances, since place-specific relations between causes, effects, policy issues, and related stakeholders can easily be outside their span of control. In contrast, as for example, De Vries (2000) and Rydin (1998) emphasise, the proximity of local governments to local circumstances and stakeholders puts them in a good position to respond to the unique manifestations of interrelated issues, which is among the key arguments supporting degrees of decentralisation. The Chinese government also recognises the need for local action and responsibility in pursuing energy transition, and goes beyond merely expecting municipalities to implement energy targets in various sectoral policies. Moreover, specific programmes were set-up to accommodate proactive local energy policies, such as the '*New Energy Demonstration City (NEDC')* programme and '*Low-Carbon City (LCC)'* programme. An integrated policy approach is highlighted in the implementation of these programmes.

Integrated working relies on municipal departments to work together by sharing responsibilities, exchanging interests and perceptions, and harmonising separate policies. While challenging by itself, this challenge might be even more pronounced in the current Chinese context. Planning and policy making in China remain strongly focused on top-down decision making within distinct policy sectors and implementation based on command-and-control (Hu et al., 2013; Wu et al., 2017). In other words, the Chinese central government develops sectoral policy targets to which the lower administrative levels must conform. Within such a hierarchical and sectoral-based institutional setting, key challenges emerge for integrated working, including coping with policy fragmentation, competing and incoherent objectives, and inconsistent instrument mixes (Candel and Biesbroek, 2016; Mol, 2016). To illustrate, minimising greenhouse gas emissions might not be compatible with either GDP growth or environmental protection (e.g., nuclear energy and hydropower). Furthermore, departments in urban China are also not accustomed to working together (Yin et al., 2016), but instead tend to concentrate narrowly on their own departmental interests and on achieving targets required by central government sectors (e.g., GDP growth, environmental and ecological protection).

Integrated working cannot be taken for granted, certainly not in a Chinese context, therefore an institutional analysis on climate policy integration is highly relevant. At present, China is arguably one of the most important countries in terms of global energy transition. Nevertheless, research into local energy transition policies and approaches in a Chinese context is still in its infancy (e.g., Cai and Aoyama, 2018; Han et al., 2018; Yuan et al., 2012). Attention to policy integration in connection to the pursuit of energy transition, in particular from the perspective of urban planning has in the past years been quite modest (e.g. Schmidt and Fleig, 2018). Additionally, these analyses of policy integration with regard to energy issues have mostly focused on western societies (Bocquillon and Maltby, 2020; Howlett et al., 2017; Persson et al., 2016). The studies addressing policy integration on energy policies in urban China, have remained fairly general by merely indicating the difficulties of policy integration and limited interactions between stakeholders (e.g., Westman and Broto, 2018; Westman et al., 2019; Zhang and Li, 2012). Thus, little is known of the exact institutional problems and opportunities related to climate policy integration (also Ruan et al., 2020). The novelty of our study therefore lies in our responses to the lack of detailed institutional analyses of the processes and practices of climate policy integration in urban China. In doing so, we also expand on the climate policy integration literature by explicating and applying a framework for its evaluation.

Thus, the aim of our study is to identify how the desired integration of energy ambitions within non-energy sectors manifests at local level in urban China, while also targeting the institutional challenges, opportunities and barriers to climate policy integration. Specifically, we analyse climate policy integration in Chengdu and Yangzhou, two Chinese cities committed to national programmes promoting an integrated approach to energy transition: the Low-Carbon City (LCC) project in Chengdu and the New Energy Demonstration City (NEDC) project in Yangzhou. Specifically, we concentrate on integraton at the public administration level; i.e., for now we ignore the private sector (markets) and civil society (citizen groups). Notably, we first aim to identify how cross-sectoral and integrated working might be possible or constrained within governmental organisations before we expand to assessing how the inclusion of other key actors might be pursued or impeded.

In section 4.2 we present our analytical framework where we have a conceptual discussion on how to understand policy integration and climate policy integration associated with integration mechanisms. We also discuss how to evaluate climate policy integration as applied in our case study analysis. Section 4.3 introduces the case studies and methodology and section 4.4 elaborates our empirical findings. Overall conclusions are provided in section 4.5, in which we assert that both integration across levels of authority and more cross-sectoral forms of communication and interaction (within networks) have a significant role in facilitating climate policy integration in China. As such, we call for a more balanced governance structure in China that combines hierarchical coordination and coordination through networks with the aim to deliver better climate policy integration outcomes.

4.2 Theoretical framework

We begin to build our framework by first explaining why policy integration is used to handle cross-cutting issues. In doing so, we will also clarify the implications of policy integration at a local level, including climate policy integration, and how to evaluate climate policy integration in practice. These questions are elaborated below from two perspectives. One is conceptual, where we present a more clearly expressed characterisation and understanding of policy integration (including climate policy integration). The other perspective is instrumental, in which we discuss the criteria we apply for evaluating climate policy integration in our analysis of two Chinese cities.

Understanding policy integration

Demands for integrated policy making have become pervasive in the western world since the early 1990s (Rode, 2019). Before then many western countries had encountered the undesirable consequences of strong reliance on sectoral legislation and policies. Because the effects of sectoral policy were largely restricted to a sole 'compartment,' where planning issues were aimed, the result has too often been inefficient duplication, blind spots, redundancy, poor social learning, and even institutional inertia (Leat and Setzler, 2002; Kidd, 2007; Eckerberg, 2009). Moreover, greater awareness during the 1980s of the global environmental crisis has increased the need for better coordination, and it was thought that the constraints imposed by the sectoral and compartmental structures should be removed. A desire for integrated governance was therefore called for to respond to environmental issues that cut across disciplinary and sectoral boundaries (Hajer, 1995). Specifically, cross-cutting issues would be rendered more effective by "going beyond the sectoral approaches" (Commission of the European Communities, 1990, p. 1) and engaging in "joined-up thinking in the development of a vision for an area" (Rydin, 2011, p. 19). Policy integration is thus seen as a desirable approach, among others, that can improve policy cohesion; it is regarded as "the management of cross-cutting issues in policy making that transcend the boundaries of established policy fields" (Stead and Geerlings, 2005, p. 446). As Westerman (1998) suggests, policy integration implies "a concern with the whole, agreement on common outcomes, and a commitment to actions and targets to achieve these outcomes" (p. 3).

The substantive outcome of policy integration is a better linked or more integrated policy agenda when coping with cross-cutting issues. Policy integration itself is then the process of pursuing and creating such substantive outcomes. Organisational structures have a profound impact on actors' behaviour since they are associated with how responsibilities are allocated, who takes the lead in organising, and how power is distributed and impacts on policy integration processes (Newman and Thornley, 1997; Nee and Strang, 1998; Pierre, 1999). In this regard, two main and contrasting governance structures stand out in political science: hierarchies and networks (Rode, 2019). In hierarchies policy integration relies on the coordinative capacity of the top of an organisation to create coherent and integrated

policies. Pursuing integration relies on the issuing of institutional mandates, the allocation of power and responsibilities across administrative levels and sectors, and is supported by a plethora of relevant administrative orders, rules, procedures, and (in)formal channels of policy coordination (Bogdanor, 2005; Acheampong and Ibrahim, 2016). Under ideal conditions, coordination in a hierarchical structure would thus deliver fully coherent policies. Ideal conditions, however, are hard to find. In reality, numerous studies show that not every organisational structure or approach is equally suited to deliver integrated policies; i.e. different ways of organising relate to different functional ambitions (e.g., Gresov and Drazin, 1997; Zuidema, 2017).

A strength of hierarchical organisational structures, and their related functionally specialised bureaucracies, is their suitability for delivering standardised and clearly defined outcomes for situations seen as isolated from a contextual environment (Miller, 1986; Mintzberg, 1993). Benefits of hierarchical structures include strong lines of control and accountability, a standardised working process, and routine implementation of policies. De Roo (2003) differentiates between pursuing so-called 'single fixed objectives' and 'multiple composite or integrated goals.' For a hierarchical structure to achieve single fixed objectives while balancing multiple, and possibly competing objectives into one integrated solution strategy, however, requires a different way of working.

De Roo (2003) argues for a decentralised way of working in unique situations, as these are strongly interwoven with a dynamic environment. Such a decentralised way of working is based on collaboration, negotiation and making sense together. This collaboration relates to a specific local context that requires integrated policy approaches (see also Christensen, 1985). Other authors also highlight the need for horizontal cooperation in more flexible, collaborative or even informal structures while pursuing integrated ambitions, or what Miller (1986) describes as an organic structure, and what Mintzberg (1993) calls an 'adhocracy'. Rather than routinised working processes focusing on a single fixed objective, the process involves making trade-offs and finding synergies and creative solutions from specific contextual conditions (e.g., Zuidema, 2017). The organisation structure now emerging as preferable depends on networks in which interactions and communications occur between individuals and organisations on the same policy level, such as between departments or municipalities (Goold and Campbell, 2002; Peters, 2006). Within such networks, the realisation of policy integration relies on mutual interests, shared responsibilities, receptivity to change, and interdependence between members and organisations with a shared understanding of what such integration could mean (Peters, 1998; Newman, 2004).

Pursuing integrated policies demands changes in how the process of policymaking and delivery is organised. First, it is necessary to reconsider the role of sectoral regulations or legislation. Strong sectoral targets can frustrate possibilities for balancing different ambitions within an integrated solution strategy. For example, standards regarding safety risks on roads are potential limitations for using electric vehicles or hydrogen as fuel in cars. Integrated policy solutions would seek to balance the importance of safety risks with the benefits of

sustainable mobility. As long as the law requires these same safety standards, however, balancing cannot take place. Hence, maximising the outcomes on one ambition (reaching safety standards) can hinder the opportunity to optimise the overall outcome across all relevant ambitions.

Secondly, it is important to develop organisational structures that allow for open discussions towards balancing various (sectoral) interests and related actors in a collaborative effort (Belaieff et al., 2007). In addition to creating cross-sectoral coordination tools (regular meetings, invitations to reflect on each other's work, requests for input), a receptive attitude is also valuable. Notably, open information, discussion, a collective learning process, and a culture of mutual support between relevant stakeholders and government sectors would be optimal (Rode, 2019). The development of cross-sectoral task forces and other horizontal networks for collaboration are good examples of supportive organisational structures. Furthermore, it would be beneficial to introduce administrative incentives for cross-sectoral organisations to enable integration, for example, in the form of budgets and leadership (Calvert, 1992; Ross and Dovers, 2008; Jordan and Lenschow, 2010). Without such incentives, communication and interaction within horizontal networks would certainly compete with established routines and ambitions of individual policy sectors or associated governmental departments, likely leading to stalemate.

Understanding policy integration in the context of energy transition

The cross-sectoral nature of energy transition urges for a harmonisation of energy ambitions with other sectoral policies and stakeholder interests (e.g., Auktor, 2017; Spijkerboer et al., 2019). As such, policy integration is among the crucial processes supporting energy transition (e.g., Adelle and Russel, 2013; Hamdouch and Depret, 2010). While policy integration typically requires action on various administrative levels (Stead and Meijers, 2004; Van Stigt et al., 2013), the local/urban level is certainly among the prima arenas for pursuing an integrated approach. Notably, it is at the local level where various sectoral and stakeholder interests can be balanced while being sensitive to distinct local circumstances (e.g., Rydin, 1998; Zuidema, 2017). Such sensitivity has become increasingly important to include when it comes to energy policies, due to the vast spatial implications of energy transition. Fossil fuels have traditionally only had minor spatial impacts, while being often limited to distinct locations (De Boer and Zuidema, 2016). In addition, they are easy to transport over the globe, allowing for easy access to energy even if this comes from remote and far-away regions. The reliance on fossil fuels has even resulted in an almost complete lack of attention from the perspective of urban planning and policies for energy untill recently (Zuidema and de Boer, 2017).

Shifting to an energy system based on renewables is currently urging urban planning to explicitly address energy as a topic (e.g., Cajot et al., 2017; De Pascali and Bagaini, 2019). Energy production through especially solar energy, wind farms, hydropower and the

utilisation of biomass require large areas to harvest sufficient amounts of energy, while being highly visible (Stremke, 2012). Furthermore, shifting to an increased use of renewables will also beg for serious investments in refurbishing the built environment, including industries, housing, our transportation system or electricity grid (e.g., Paiho et al., 2019). As a result, energy transition also explicitly relies on the interplay of technical, social and institutional innovations in a geographical setting (Bridge et al., 2013) and "these particular assemblages vary over space and time" (Faller, 2016, p. 86). That means, shifting to a renewables-based energy system will explicitly urge us to recognise and respond to the interrelatedness between energy systems and distinct local (urban) environments. Such interrelatedness, clearly, is more than just respecting and adapting to the physical environment; e.g. building stock, climate, land uses, infrastructure. It is explicit also in the engagement of various governmental departments and local stakeholders in local energy production or resistance to renewable infrastructures (e.g. solar fields, wind farms).

Policy integration, thus, is a crucial process for supporting energy transition in an urban environment. Nevertheless, the energy system and related, the energy sector, has in the past been approached as relatively isolated from other policy sectors (e.g., De Pascali and Bagaini, 2019; Verbong and Geels, 2007). This situation can also be witnessed in China, where energy transition has traditionally been treated as a technological issue (Andrews-Speed et al., 2014) and attempts at cross-sectoral coordination are recent and largely dictated by top-down steering by the sectoral NDRC (Ruan et al., 2020). The isolated position of energy vis-à-vis other policy sectors is also well-illustrated by the lack of attention it long received in the international literature on policy integration; i.e. policy integration has become an important principle guiding public policy development mostly when considering other policy fields, such as the environment (Tosun and Peters, 2018), land use (Geerlings and Stead, 2003; Taki et al., 2017), tourism (Aall et al., 2015; Brendehaug et al., 2017) and urban sustainability (He et al., 2018; Khan et al., 2020). Attention to policy integration regarding energy sector, however, has been growing over the past decade, both in practice and theory (e.g., Camargo and Stoeglehner, 2018; Giannouli et al., 2018; Halim, 2018; Hogl et al., 2016). However, in line with the observation by Spijkerboer et al. (2019), there is still limited attention for policy integration and harmonisation to be applied in the context of (urban) energy transition and area-based thinking. Within this limited literature, the focus lies mainly on western societies. Hence, this chapter will address this research gap identified, by using the framework developed on climate policy integration and add value by focusing on energy and urban planning in Chinese context.

Climate policy integration is usually regarded as a component or subset of environmental policy integration, or resembling environmental policy integration (e.g., Ahmad, 2009; Jordan and Lenschow, 2010). Environmental policy integration refers to the incorporation of environmental concerns into non-environmental policy sectors to overcome conflicts and create coherent policy approaches (Brendehaug et al., 2017; Van Oosten et al., 2018). There are two dominant ways of conceptualising climate policy integration in the literature: either by simply replacing the word 'environmental' with 'climate' in the definition (Rietig, 2013),

or by building on existing environmental policy integration approaches while considering potential differences and conflicts between climate change and environmental governance (Dupont and Primova, 2011). It might be appealing to have a definition for climate policy integration by just replacing a word; however, integrating climate change into various policies is not the same as integrating environmental concerns into alternative policy agendas.

Measures for dealing with climate change (including energy) may be at odds with environmental objectives (Rietig, 2013). For example, hydropower development can contribute to climate mitigation, but typically has negative environmental consequences for biodiversity (Kelly-Richards et al., 2017). Hydropower impacts ecosystems and leads to soil erosion caused by changing water levels. When integration is framed as a policy outcome, climate policy integration is conceived as more measurable an outcome compared to environmental policy integration. As Jordan and Lenschow (2010) argue, evaluating the state of the environment is highly complex since it is affected by myriad factors, such as health, water resources, solid waste, biodiversity, and air pollution (also Moussiopoulos et al., 2010). By contrast, climate change and specifically energy outputs (e.g., carbon emissions or energy efficiency) are more easily and directly measurable than the wider state of the environment (Dupont and Primova, 2011). Because of this difference in measurability, the literature on environmental policy integration mostly focuses on the process of policy integration rather than on outcomes in terms of material delivery (Adelle and Russel, 2013). However, policy integration not only involves changing bureaucracies and processes, but also leads to impacts in the 'real world' (Mickwitz and Kivimaa, 2007). Therefore, like many other authors of climate policy integration literature, we examine real life integration consequences and effects in our study. Studies show that climate policy integration potentially attracts political support more easily than environmental policy integration (Adelle and Russel, 2013). Nowadays, renewable energy (e.g., solar and wind) is increasingly seen as compatible with social and economic benefits, while many environmental issues are perceived as largely incompatible, especially with economic growth (Keček et al., 2019).

We specifically target energy transition policy. Hence, in our research climate policy integration considers the incorporation of energy concerns into all stages of policy making in non-energy sectors, and a commitment to minimise contradictions between energy policies and other sectoral policies. Meanwhile, we also treat climate policy integration as delivering outcomes in terms of lower CO_2 emissions.

Criteria for evaluating climate policy integration

With regard to assessing policy integration, researchers have developed a variety of methods that unfortunately largely focus on environmental policy integration (e.g., Lenschow, 2002; Lafferty and Hovden, 2003). In line with environmental policy integration's emphasis on the processes of integration, these methods mostly do not explicitly address the degree of integrated delivery of policies in terms of material outcomes. For example, Simeonova and van der Valk (2009) present four criteria to assess

environmental policy integration: (1) whether there are plans and strategies that can support environmental policy integration; (2) whether there are shared responsibilities for environmental policy integration between sectors (e.g., political commitment); (3) whether there is a communication network supporting the process of environmental policy integration (e.g., collaborative practice, inter-organisational networks and expert teams); and (4) whether there are any legal and regulatory procedures requiring environmental policy integration (e.g., environmental impact assessment).

Here we consider climate policy integration as both a process and a contributor to material outcomes. Therefore, we follow the framework for analysing climate policy integration proposed by Brendehaug et al. (2017), which explicitly includes policy outcomes as being among the criteria for analysing climate policy integration. Nevertheless, we also notice that the framework proposed by Brendehaug et al. (2017) sees climate policy integration largely as a process that follows from the creation of (static) institutional regulations and rules enforced by formal governmental channels (e.g., instruments, organisational structures, procedures). We argue that, next to these 'rules of the game' (Spijkerboer et al., 2019) there is also the so-called 'play of the game' (Spijkerboer et al., 2019), where policy integration is shaped by dynamic interactions and communication between actors and departments. Both two aspects are interwoven and considered necessary for jointly producing the outcome of policy integration. Indeed, Simeonova and van der Valk (2009) also suggest climate policy integration involves aspects such as commitment, sharing responsibilities, collaborative practices, etc. While considering this 'static-dynamic interaction' we have interpret the five indicators based on the framework of Brendehaug et al. (2017) and translate these into distinct questions to analyse climate policy integration as shown in Table 4.1.

Table 4.1 Summary of the analytical criteria to assess climate policy integration

Criteria	Key questions
Inclusion	• How does your department define or think of energy transition? • To what extent and in what ways have energy objectives been considered? • Are there any instruments (e.g. protocols, rules, requirements) that support cross-departmental coordination in the decision-making process? • What kind of organisational structures or approaches exist to support integration? • Are there plans and strategies that can support climate policy integration? • Are you motivated to pursue climate policy integration? • Do you see the added value of pursuing climate policy integration? • How are responsibilities distributed and who takes the lead in organising and pursuing integrated policies?
Consistency	• Is there a shared understanding of energy issues among actors and policies? • Have contradictions between policy goals been identified, and have there been efforts to minimise known contradictions?

Weighting	• What is the relative priority given to energy issues as compared to other issues on the agenda? • Are there procedures for determining the relative priorities?
Resources	• Are competence, time and other resources available for the promotion of energy issues? • Is there internal and external know-how about dealing with energy issues? • Are there funds available for cross-departmental working or integrated policy delivery?
Performance	• Are policies implemented and evaluated? • Are their practical consequences or impacts visible and measurable?

Source: Based on Mickwitz et al. (2009), Mickwitz and Kivimaa (2007) and Brendehaug et al. (2017)

The first indicator of successful climate policy integration, *inclusion*, means that energy issues and area-based policy strategy are included in the policy making process of other policy domains, taking note of the importance of energy-related concerns, ambitions, and aims which are rightly reflected in written statements and added to the sectoral agenda. *Consistency* refers to a shared understanding of the energy issue among relevant sectors and policies. Thus, different sectoral goals and instruments should be consistent with each other regarding area-based, integrated energy governance and there should be a commitment to minimise contradictions (Lafferty and Hovden, 2003). *Weighting* means the relative priority given to energy issues, as compared to other policy objectives involved, in the face of different sectors having their own interests and targets. Furthermore, achieving successful climate policy integration also requires knowledge and *resources* (e.g., time, personnel, funding, organisational structures, etc.), the 'know-how' to deal with issues of the energy transition, in particular area-based and integrated energy planning. Finally, successful climate policy integration should bring real and positive consequences and impacts to the practice, for example, energy efficiency. Brendehaug et al. (2017) discuss the criterion *reporting*, which reflects the actual delivery of policies in a material sense. We are less interested in reporting per se, than on actual performance: Did the policy deliver an integrated solution? Therefore, we use *performance* instead of reporting as our fifth criterion. Performance also includes ex post evaluation of policy implementation that could give further insights into real impacts in practice.

4.3 Methodology

In response to our research objective, this chapter examines how climate policy integration is emerging in two Chinese local authorities via two qualitative case studies. These case studies are not representative of China as a whole, but rather our aim is to identify institutional challenges and opportunities for climate policy integration, and to explore in particular the integration of energy ambitions within non-energy sectors in urban China. We chose to study two cities from two prominent national programmes that try to boost local

action towards energy transition, guaranteeing that our case cities indeed are pursuing integrated approaches to energy transition. The programmes are the *"Low-Carbon City" (LCC)* and the "*New Energy Demonstration City*" (NEDC) programs. Both programs were launched by different Chinese ministries; they are the most influential programmes for promoting urban sustainability by integrating environmental objectives into local policy making and implementation.

Both projects have been set up with their own goals, institutional structures and frameworks. The NEDC project specifically focuses on the shift to a sustainable urban energy system through developing renewables-based projects and technologies (NEB, 2012). The added value of using a case in the LCC project is that this programme not only includes energy ambitions, but also aims for a wider set of ambitions to promote a low carbon and ecologically-sound cities. Hence, where the NEDC programme targets urban energy transition through staring within only one sector (energy), the LCC targets urban energy transition as a part of a wider sustainability effort encompassing various policy sectors and thus departments (e.g., transportation, industry, housing, economy) at the same time (NDRC, 2010). As a consequence, the different focus and related institutional structures of the two projects might trigger different actions regarding policy integration on a local level. It is because of this possible difference that we considered it attractive to choose a case from both two projects.

Ultimately, we selected the LCC project in Chengdu and the NEDC project in Yangzhou (Fig. 4.1). Although it is not our intention to generalise based on only two cases, we do aim to create a realistic picture of the types of processes, barriers and mechanisms used in Chinese cities in pursuing energy transition. The intention of our explorative study, thus, is to shedlight on what might be key integration challenges in urban China. Chengdu and Yangzhou are selected for this research based on several arguments. For one we limited the scope of cities to study by excluding smaller cities in less-developed Chinese regions (e.g., Gansu or Guizhou province), with the argument that we did seek cities who could safely be assumed to have some degree of financial resources and institutional capacities to engage with the projects. Second, we selected cities with proven experience working on the project and that have available information online or in reports. Thirdly, we identified both Yangzhou and Chengdu as fairly progressive on issues related to energy and sustainability, making them highly suitable to study how climate policy integration might unfold within the chosen LCC and NEDC projects. Yangzhou stood out as it has been identified as a 'leading municipality' for undertaking energy transition measures (Menglin and Shanheyi, 2015). The city has also been named as the demonstration city of national smart grid, national renewable energy buildings in China (Yangzhou government, 2011), and therefore it was highlighted as a good example of the work done in the pursuit of energy transition. Furthermore, existing contacts in the city helped us in gaining access to information. Chengdu was chosen due to its prestigious image as the 'most livable city in China' (Zhang et al., 2020) and there is existing evidence of this city taking action to make it more sustainable (Fu and Zhang, 2017).

Figure 4.1 Location of the two case studies (*Source:* Authors)

Introduction to the case studies

Chengdu (population: 14.4 million) is the capital city of Sichuan province in mid-west China. Economic growth in Chengdu has been rapid, and in 2017 its GDP reached ($USD) 138,05 per capita, ranking it 32nd among the top 50 richest cities in China (China's Statistical Bulletin, 2018). *Low-Carbon City (LCC)*, launched by the National Development and Reform Commission (NDRC), encompassed five provinces and eight cities in 2010. In December 2012, LCC was expanded to cover another 29 cities and the provinces, including Beijing, Shanghai, Qingdao, and Hainan province. Chengdu has recently been working diligently to become a sustainable city and was selected as one of the third batch of pilot cities to join the LCC project in January 2017 (NDRC, 2017). The Chengdu municipality subsequently installed a leading group of administrators led by executive vice-mayors and composed of various representatives from local government departments (see Fig. 4.2). This group is supported by an executive office for implementation of its plans and policies, with the municipal DRC (Development and Reform Commission) leading the project implementation. The DRC is primarily responsible for formulating and implementing strategic and overarching policies on the city's economic and social development. The DRC has several sub-departments, including those on recources conservation, strategic development and planning, regional coordination development, social development, infrastructure constructions and national economy. The LCC project in Chengdu is the responsibility of the entire DRC, supported by research institutes and think-tanks (e.g., Chengdu Economic

Development Research Institute). In addition, the Chengdu DRC is responsible for building organisational capacity in terms of formulating working procedures and communicating with all relevant governmental departments. Other responsibilities include monitoring, evaluating and implementing policies, together with the Municipal Supervision Office, and directly reporting to the national NDRC. Other relevant governmental departments (e.g., bureaus of environment, housing and transportation) are obliged to translate energy policies into their own departmental policies during the policy making process and contribute by implementing these policies. Moreover, the Municipal Finance Department provides financial support to those policies conducive to the creation of a low emissions environment.

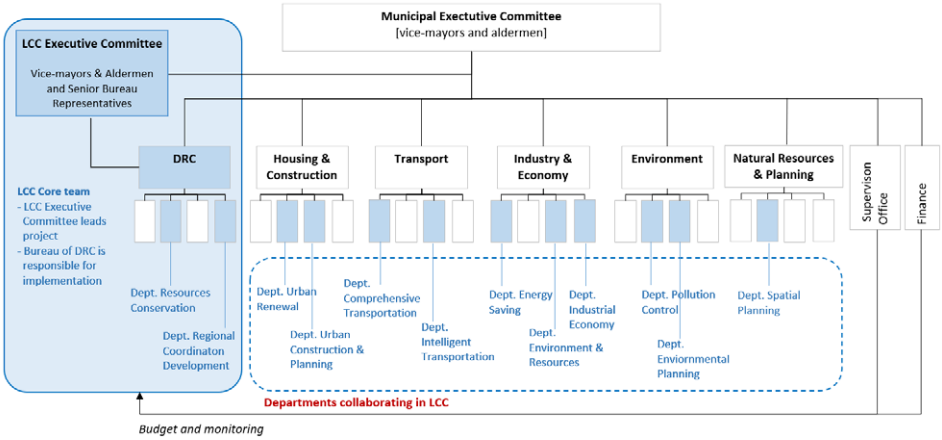

Figure 4.2 The Governance structure of LCC Project in Chengdu (*Source:* Authors)

Situated in the economically strong eastern part of China, Yangzhou is smaller than Chengdu, with 'only' 4.4 million inhabitants. Yangzhou traditionally commits to a livable city ideal, and in 2014 was identified as one of 81 pilot cities to implement the *New Energy Demonstration City (NEDC)* project by the National Energy Bureau (NEB) (NEB, 2014), a department of NDRC. To implement this NEDC project, the Yangzhou municipality applies a fairly similar institutional structure as Chengdu by setting up a leading group of administrators, but with one key difference: the energy department, a sub-department of the municipal DRC, leads the project implementation. Hence, the NEDC project cannot assume other DRC sub-departments such as resources conservation, strategic development and planning feel responsible to use their coordinative capacity in engaging other municipal departments. Rather, the energy sub-department has to either do such engagement themselves or convince other DRC sub-departments to join forces with them. Only the municipal bureaus of technology, and economy and DRC, are also responsible for applying financial support from provincial and national governmnets. Fig. 4.3 shows how different governmental departments relate to one another to implement the NEDC project in Yangzhou.

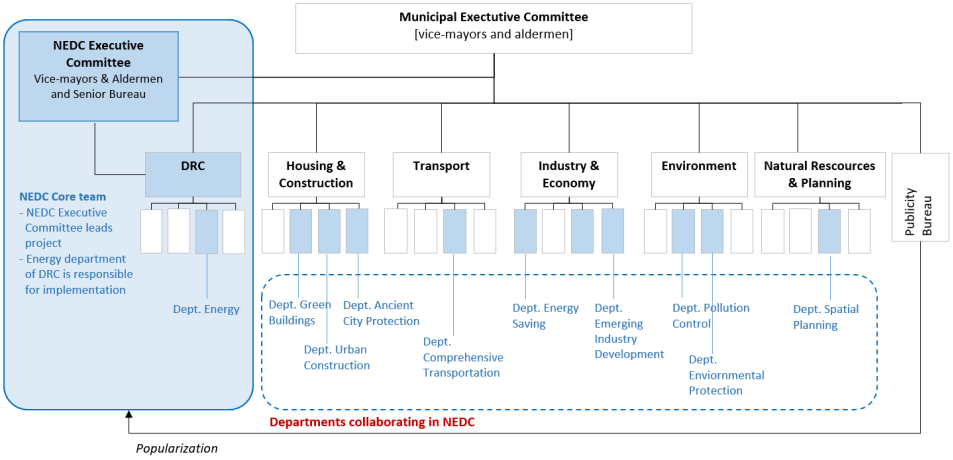

Figure 4.3 The Governance structure for implementing NEDC Project in Yangzhou (Source: Authors)

Data gathering and analysis

Our analysis consists of two parts: policy document analysis and in-depth interviews with key actors. First, we examined all detailed management plans and documentation regarding our two case study projects, and reviewed national and local policy documents and measures related to policy integration on energy from main government departments. Our groundwork comprised investigating whether and how energy ambitions are integrated into departmental policies and plans, thus improving our understanding of the general governance process of climate policy integration. Part two involved in-depth, semi-structured interviews with 20 respondents (11 respondents in Chengdu and 9 in Yangzhou) between June and July 2018 (Appendix A). Respondents comprised scholars, private/third sector representatives, and senior government officials from different departments of the local authority, including planning, economy, housing, transportation, and environmental protection. The amount of interviews chosen was influence by both our desire to have a broad selection of various stakeholders and departments and saturation occuring after adding more respondents upon identifying new findings. The policy document analysis and analytical framework discussed in section 2 forms the basis for the interview guidelines, and Table 4.1 frames our pertinent interview questions. The 45-60 minute interviews were audio-recorded and fully transcribed. The transcripts together with policy documents were systematically coded following a three-step-method:

(1) Coding of national/local policy documents: focus on how does policy content itself define, value and support 'policy integration';
(2) Coding of the perceptions of key stakeholders (20 interviews) for each criterion: inclusion, consistency, weighting, resources and performance (Table 4.1);
(3) Looking for interrealtionships and differences between step (1) and step (2), and identify the reasons.

The use of the computer programme Atlas.ti supported the coding process and the code tree is presented in Table 4.2. For example, codes in step (2) for inclusion were "policy strategy" (e.g., what kind of organisational structures or approaches exist to support integration?), "policy priority" for weighting (e.g., what is the relative priority given to energy issues as compared to other issues on the agenda?), and "expertise" for resources (e.g., is there internal and external know-how about dealing with energy issues?). These codes are related to the analytical framework/criteria discussed in section 4.2.

Table 4.2 Code tree for the policy documents and interviews

Inclusion	Consistency	Weighting	Resources	Performance
Policy Targets Policy Strategy • Instrument • Organisational Structure • Motivation Leadership	Contradiction Mismatch Shared Under-standing	Policy Priority Procedures	Competence Expertise • Internal • External Funding Other Resources	Policy Implementation Practical Impact

4.4 Findings

Our preliminary analysis of policy and research reports on the implementation of the LCC and NEDC projects provides insights into the institutional challenges for policy integration; notably, most local authorities lack comprehensive thinking across policy sectors and departments. To illustrate, the 2016 NEDC Project Report concluded that "…A much stronger effort is needed based on a multilateral inter-organisational governance structure where a common vision is developed out of an agreement based on a mutual understanding of the role of energy transition for the cities' future and a shared feeling of responsibility" (p. 39). The 2014 LCC Construction Report also states that policy integration in urban China remains limited. However, these evaluations say little about the exact institutional challenges, opportunities and barriers for policy integration, which we want to further identify through close analysis of our two case studies.

Inclusion

In both cities we found that the inclusion of energy ambitions and targets in non-energy related policies is strongly dependent on national incentives; i.e., there are limited local attempts at creating cross-departmental and integrated policies. This finding, first of all, relates to the strong dependence on national policy incentives in Chinese local governance. Following the choice to make energy transition national priority, national ministries and agencies have been pushed to integrate energy goals into their own policies. That is, the

state uses existing departmental policies to issue energy targets that local governments have to work with, e.g., targets for electric vehicles (transportation), energy efficiency in houses (housing), or energy efficiency in industries (industry). Policy integration within this approach, however, depends on implementation through sectoral policies to be implemented locally by distinct departments. While this might also be considered an impetus for a more integrated approach locally, our results show a different picture.

Most respondents from the different municipal departments do confirm that higher level governmental mandates and political pressure are fostering the inclusion of low-carbon and energy-related targets into their departmental policies and strategies. For example, in Chengdu we found that the local transport department has issued policies supporting the use of new energy vehicles, and has regulations promoting the operation and management of the timeshare rental industry on new energy vehicles (Chengdu General Office, 2017). Nevertheless, implementation remains based on work done within distinct departments, a situation also encountered in Yangzhou; i.e., in the two cities there is little cooperation across departments. When energy concerns are integrated in other policy sectors or the work of associated governmental departments, it is typically not due to collaboration across departments locally, but rather as a result of national targets. An example is given in the Yangzhou housing bureau (department), which aims for all new buildings to realise 50% less energy consumption than the average in existing buildings. In addition, solar thermal must be installed in +50% of new buildings (HCDJS, 2018). "These aims are also the mandatory targets directly allocated by our higher level governments. Nevertheless, our work is to try the best to complete these tasks, but how to link them with other departmental policies is not our main business" (YZ05, 2018). Therefore, in neither of the two cities were the national programmes regarded as the joint responsibility of all relevant departments; they were instead framed as isolated or stand-alone projects solely the responsibility of the municipal DRC (Development and Reform Commission) (including the energy department) for spatial planning and implementation. Energy was for other municipal departments limited to the aforementioned national mandates for energy-issue inclusion. As respondents in Chengdu's DRC stated, "Local climate policy integration is far from adequate, and when it comes to energy issues, other departments always narrowly think it is merely our department's issue while not strongly relating to them. Dealing with energy issues actually needs a joint force from all relevant governmental departments" (CD01, 2018). At first glance, the situation was even worse in Yangzhou, where even other relevant sub-departments within the DRC also took an 'indifferent' attitude to the NEDC project implementation. Hence, the NEDC project was considered the responsibility and task of only the DRC's energy sub-department by both other DRC sub-departments and other sectoral municipal departments. Nevertheless, this de facto resulted in the same result as in Chengdu: no feelings of collective ownership or responsibility for the project across the municipal organisation.

Along with the routine of merely following national sectoral incentives, we identified three more factors that help explain the modest local efforts at cross-departmental and integrated working. To begin with, the governance structures (see Figs. 2 and 3) that Chengdu and

Yangzhou adopted to implement their LCC and NEDC projects do not promote mutual ownership across the municipal departments needed to make the projects a success. After all, responsibility in Chengdu is allocated in only one department (DRC), and in Yangzhou even in a sub-department (the energy department within the DRC). Given that the municipal DRC has the same administrative rank as other departments (e.g., bureaus of transport, industry and housing), the DRC depends on the *willingness* of other departments to follow its suggestions and commit to the projects. They cannot compel them to pursue its visions and targets. To illustrate:

> Implementing a new project requires creative ideas, efforts and exchanges from all related departments. The Municipal DRC is in charge of organising meetings across departments to discuss these ideas, dealing with their different interests and views, and even assigning the implementation tasks to them. Nevertheless, if the DRC takes these actions not in the name of the Municipal Government, but just by its own power alone, many other departments are actually less motivated to join any discussions or implement the project (CD08, 2018).

Due to sharing an equal administrative rank, some departments in Yangzhou municipality have even considered contributions to the NEDC project as additional work to help the municipal DRC, and without having seen any clear benefits. Consequently, as a government official remarked: "It is then difficult for some departments to take the project implementation seriously" (YZ06, 2018).

Secondly, in both cities there was no general climate policy integration strategy. A structural communication strategy for climate policy integration to ensure a contribution from other relevant departments and stakeholders did not exist. Instead of following an inclusive and holistic process professed by local government and its experts as essential to the energy projects' success, many local government departments and actors remained detached from policy making. Only in Chengdu was there even an attempt at developing something of an holistic approach. The initial measures and plans were drafted by the municipal DRC and an external consultancy firm. Meanwhile, the DRC asked for advice and feedback from other government departments on what kinds of measures and strategies could be taken and whether these measures aligned with their own departmental interests. The plan was then adjusted based on this departmental feedback. Nevertheless, communication was largely limited to bilateral communication between the DRC and the other individual departments only by phone or by email, with few group discussions or meetings across departments. We also found that local authorities have mostly overlooked or been oblivious to the benefits of pursuing integrated energy policies. A DRC officer explained: "Frequent group meetings can make things more complicated and might need a longer time to have a clear idea on what to do and how to do it. More importantly, we do need the leaders to see our efforts on the LCC project implementation in a short time, doing so [group meetings] would be more time-saving" (CD 02, 2018). Although a plan was deemed essential, a systematic, holistic and cross-departmental plan, based on mutual understanding of each other's responsibili-

ties and interests, was missing. No clear agreement could therefore be reached among the relevant departments on how energy concerns would be addressed. An officer from the industrial department complained, "We always suffer from not having enough time to seriously consider how we deal with governmental affairs in a coherent fashion, one after another, since we are forced to complete each task in a given timeframe. Nowadays, we rely too much on a high speed of completion, while the quality of what we complete should actually be the fundamental thing" (CD02, 2018).

Thirdly, in both cities complying with central government targets related to energy were already seen by most departments as their contribution to the project implementation, indicating that the project itself did not produce much added value regarding these departments' contributions. The only exceptions were a few additional and tailor-made measures and strategies, especially for the LCC project in Chengdu. While pursuing the NEDC, a respondent in Yangzhou stated, "In following the central government's requirements, we already include energy targets into our departmental plans, for instance, the low-carbon economy development plan. This is also a part of the contributions for NEDC project implementation. Therefore, we really do not have to make a particular plan for the project. Besides, we have less willingness to always make plans for numerous energy-related projects which are just issued by different ministries actually with the similar goals" (YZ02, 2018). We also found that, in both cities, no real stimuli were in place to support their pursuit of climate policy integration.

On a positive note, we identified that climate policy integration at a local level can gain urgency when alongside the DRC-based governance structure; also top-down leadership exists. When senior officials are determined to work on energy issues, their political willingness can push for enhanced and multilateral communication and support collaboration among departments and result in better integrated and collectively supported plans. In the case of Chengdu's LCC project, support of the city mayor has raised awareness within various non-energy departments regarding low-carbon city development. Because of this increased attention for energy issues by political leaders, the municipal government organised two intensive conferences in 2017 with main senior governmental officers from all relevant departments and other stakeholders such as experts, local community members, and energy company leaders. The conferences explored both how different stakeholders can collaborate and also reflected on the problems and lessons of previous implementation efforts. Although limited added value was created in the LCC project, there was nevertheless modest development towards more integrated plans due to the active promotion of mutual commitment and multilateral communication in 2017. "These conferences have helped various departments better understand their respective tasks and responsibilities", as stated by a scholar in Chengdu (CD11, 2018). This also reflects the tendency in China to be sensitive to hierarchy and signals given by key political leaders: "As long as the senior leaders pay attention to certain issues, those issues can be better implemented with more motivation since as a lower-level government we have to conform to the mandates" (CD07, 2018).

Consistency, weighting and resources

Consistency

Without a sense of common ownership of the NEDC and LCC projects in both cities, there is also little common understanding of what is needed to pursue a local energy transition. Instead, focus is merely on national sectoral policies that might include energy targets, but not on energy transition as an issue in and of itself. In fact, we found little evidence in both cities that energy transition is even regarded as urgent outside of the local DRC (Chengdu) or even the DRCs energy sub-department (Yangzhou).

Inconsistencies stem from some contradictions between policy agendas. One crucial example is the ambiguity of land use regulations, where there can be totally different land use purposes stipulated by different policy documents for the same land block, as happened in Chengdu:

> On the same land plot, the National Land Plan regards it as a farmland, and it would be defined as a woodland in the Forest Land Plan while we might consider it as urban construction land in Urban Planning. If there is a plan to develop renewable energy projects, the first but also very complicated thing is to change the land use, which would involve interest harmonisation among departments (CD09, 2018)

A comparable issue occurred in Yangzhou, as explained by a municipal officer:

> When it comes to offshore wind power in our Jiangsu province, conflicts between plans can always happen, such as between the Energy Plan and the Ocean Plan, sometimes also with the National Defense Plan. That means the same land is allocated for port use in the Ocean Plan, whereas it is also planned for developing offshore wind farms in the Energy Plan. Some project constructions are already approved by the energy department, but if the oceanic department says no, the project fails to continue (YZ04, 2018).

Another example is the mismatch of policy ambitions on transportation and urban planning in Chengdu. The bureau of transportation aims to promote electric car sharing: "Until the end of 2020, the entire city is aimed to be covered by a wide range of new energy vehicles timeshare rental service network. Notably, the number of service networks is planned to reach 5,000 and public charging stations piles up to nearly 20,000" (Chengdu Transport Commision, 2017). This ambition, however, creates tensions with urban planning efforts to lower already crowded urban areas, add public space, expand parking areas and recofiguring streets. Notably, a timesharing rental service network of electric vehicles conflicts with the policy *Administrative Regulations on the Appearance of the City and Environmental Sanitation of Chengdu Municipality* issued by the bureau of urban management and law enforcement, stating Chengdu aims at "prohibiting the occupation of urban streets and public space for carrying out business activities" (UMLE, 2012). Meanwhile, it also conflicts with the rule

of 'making sure the priority of public space use' that is defined by planning department in Chengdu Urban and Rural Planning Ordinance (2017). Without a shared sense of urgency, ownership and even understanding of the issue of energy transition, it is not surprising that energy remains a priority only in the local DRC (Chengdu)s or energy sub-department (Yangzhou). Significantly, we also found that existing plans and strategic documents do not help to promote such a shared understanding or ownership. Quite to the contrary, they remain largely based on departmental priorities that are sometimes confusing and lack an integrated vision. Not surprisingly, the only mechanisms in place to promote an integrated approach comes from the municipal DRCs in both cities. Mostly they use interactive meetings among departments so as to create more understanding, awareness and remove contradictions. Nevertheless, it is a fairly weak tool that does not change how most other departments continue to see the NEDC or LCC as a standalone project, and energy transition as not their responsibility. Most of all, despite the best intentions, meetings and interactive sessions are hardly enough to push departments to alter their plans, priorities or even habits. As a district government official in Chengdu stated, "At present, policy suggestions for LCC projects in made by people in communicative meetings are still very much focused on their own departmental interests and visions. For the project as a whole, an integrated understanding and discussion across departments is not yet there" (CD06, 2018).

Weighting

Energy ambitions still have difficulty competing with other key policy priorities in both Chengdu and Yangzhou. This largely applies to the sometimes conflictive balance between promoting GDP growth as well as energy transition. To illustrate, Chengdu's 13th Five-Year-Plan on economic and social development still emphasises local GDP growth as the overriding policy goal (Chengdu FYP, 2016). Not only does this goal give the green light for expanding fossil intensive industries and mobility, but it also implies that energy efficiency measures, such as refurbishing factories, are not popular as they are seen as barriers to rapid GDP growth. The promotion of renewable energy projects might contribute to reaching GDP goals, but they are not yet considered fully compatible with them:

> Implementing renewable energy projects sometimes has been a conflicting interest with GDP growth. For example, the profit of running a thermal power plant is much higher than a solar panel project, since the tax of solar panel companies can be exempted as specified in the policy. Once such conflict happens, there will be a reluctance among departments to promote the energy projects (CD03, 2018).

In Yangzhou a more subtle tension between GDP growth and energy transition was identified. As an officer stated, "Renewable energy projects (e.g., photovoltaic projects) normally need a large area of land, which other departments would also like to use for more GDP growth-driven industries, for example, real estate development from the planning department" (YZ02, 2018).

With regard to balancing energy ambitions with other key societal interests, it is more onerous to identify priorities. This is true not only for us as researchers, but also within local governments. We observed increases in conflicts between energy and other interests that are currently difficult to manage. To illustrate, in Yangzhou expanding the photovoltaic industry can result in housing demolition, which "leads to problems such as reluctance of resettlement or compensation allocation" (YZ05, 2018). Also, wind turbines can produce noise pollution and, although there is no pollution at all for solar power generation itself, the process of producing silicon panels has a heavy pollution load. Currently, as was illustrated by one of our interviewees, there are limited conflict resolution strategies: "If there is no effective communication mechanism to get consensus on energy issues, such conflicts between governmental departments can always stall the process of project implementation" (YZ03, 2018). In the meanitime, neither Chengdu nor Yangzhou has formal produceres or mechanisms in place for resloving conflicts between departmental interests or for determining relative priorities. Rather, both rely on either informal discussions (e.g., private meetings) or power relations (i.e. resort to a higher authority). As an officer in Chengdu planning department stated, "If there are conflicting departmental interests that cannot be solved by departments themselves, then we often report the issue to the executive committee of LCC project. The final decision will be made by vice mayors or the mayor" (CD06, 2018).

On a positive note, our respondents in both cities nevertheless acknowledge an increase in the importance of energy ambitions and low carbon development in recent years. Although Chengdu and Yangzhou continue to prioritise other economic or political objectives, nowadays energy issues are clearly seen as valuable. In Chengdu, "even district and county-level governments often come to us, trying to get professional advice on how to deal with the energy transition, and nothing like this ever happened two or three years ago" (CD02, 2018). Respondents in Yangzhou referred to national policies urging for energy transition and indicated them as important signals that impact local political awareness and also activate other departments to think about energy as an issue. In both cities environmental concerns in China, notably serious air pollution caused by dependence on coal, were also identified as triggers for increased awareness. Finally, as noted in Yangzhou, renewable energy is becoming economically viable with future prospects also beginning to propel energy up the policy agenda for Chinese local governments (YZ08, 2018). Nevertheless, in both cities energy transition remains a relatively marginal activity in local policy making.

Resources

A lack of competent staff and expertise was identified in both cities as a key challenge. Notably, as a respondent in Yangzhou articulated, "The energy transition is something new, especially for us working in lower-level district or county government, thus we often have difficulties during the process of policy making and implementation" (YZ03, 2018). As result, few people have sufficient knowledge and expertise, and when they do, it is in the realm

of practical and technical issues. What was especially lacking in both cities were skills and expertise for cross-departmental and interdisciplinary communication. "Most experts we can find right now for energy transition are more skilled in dealing with technical problems, such as solar cells or solar heaters. However, expertise on the institutional and governance level is far from adequate" (CD01, 2018).

In the meantime, despite the energy issues climbing up the political agenda, all respondents in both case study cities mentioned the ongoing limited support in terms of resources or expertise from national and local government. In fact, all respondents described limitations or even the complete absence of financial support for advocating energy transition policies as a crucial barrier. For Chengdu this meant that LCC project implementation was under pressure, even within the DRC that saw it as its responsibility; while in Yangzhou's case the lack of funds undermined cross-departmental working and integrated policy delivery even within the DRC. Faced with financial constraints, most municipal departments are not willing to move beyond their own energy-related targets. Furthermore, both cities noted difficulties acquiring new knowledge and expertise on pursuing an energy transition, i.e., there was little scope for training or hiring external expertise:

> Even if experience exchange meetings for LCC project implementation are sometimes held by the national government, the focus of such a meeting is more on what policy measures and actions have been taken, but not really on how to pursue a holistic and integrated approach in dealing with energy transition (CD04, 2018).

Especially problematic were how to translate energy ambitions into existing departmental plans, instruments and practical policy measures (both cities), create new cross-departmental networks or institutions (both cities), acquire new technological skills (both cities), and develop new governance structures (both cities). The result is that integrated working becomes nearly impossible, as was well-illustrated by a scholar in Yangzhou: "It is hard to come up with a holistic and integrated view to implement the project as long as they (governmental officals) don't have adequate opportunities for learning and getting mutual support between departments" (YZ09, 2018).

Performance

In both cities respondents from all government departments expressed their own achievements with a tremendous sense of satisfaction in implementing energy policies or measures. These achievements have clearly also contributed to the pursuit of low carbon practices and energy transition (e.g., in housing, transportation, economy, and industry, see Table 4.3). Nevertheless, all respondents admitted that the achievements were primarily the result of conforming to central government requirements, where energy targets had been incorporated into departmental policies rather than direct contributions to the LCC or NEDC projects. Although these policy achievements are also listed as contributions to these projects, there is little local department motivation to pursue additional energy ambitions.

Local authorities also reported caring more about the implementation of tasks required by higher-level government than promoting local energy projects *per se*. Since there are no evaluation and monitoring mechanisms developed by the central government for LCC and NEDC, the cities can simply report implementation outcomes to the central government by collecting each departmental achievement related to energy. It therefore seems that the energy projects LCC and NEDC largely exist in name only.

Table 4.3 Main achievements of implementing energy targets in two case study cities

Bureaus (departments)	Chengdu	Yangzhou
Housing	• Prefabricated construction techniques have been improved and Chengdu got approval from central government to be among the first batch of demonstration cities for refabricated buildings in November 2017; • Until 2017 the construction area of green buildings was designated up to 12.57 million square metres	• In 2017 newly-built energy-saving building areas comprised up to 8,000 square metres, saving CO_2 emissions up to 90,000 tons; • Yangzhou has been approved by the State Council as the 'demonstration city of renewable energy application in building'; • Introduced renewables technologies into Yangzhou's ancient city's renovation work, e.g., solar panels, ground source heat pump(s)
Transportation	• Developed new-energy timeshare rental system and put 3,600 new-energy cars into use in 2017; • Introduced a total of 849 new-energy buses for use starting in 2017	• In 2017 more than 900 charging stations were installed for electricity vehicle use; • Over 1,000 pure electric and hybrid electric public buses were in use as of 2017
Industry	• Closed down 100 plants with obsolete production capacity in 2017; • Three waste burning power plants were built and made operational	• Grid-connected electricity generation from distributed photovoltaic projects has reached 167 Mwh, making the city a front-runner in Jiangsu province; • A wind power project with 50MW installed capacity is up and running

(*Source:* Interviews 2018)

Evaluations by local governments do exist, but they are typically conducted within departments, not by the city as a whole. To illustrate:

> At the municipality, we do not hear about an evaluation system, especially for the NEDC project. But we do annually self-evaluate our work, for example implementing policies for saving energy in buildings. However, sometimes we do not exactly know what the problem is with the implementation or how to better improve our work. After all, there is no objective third party getting involved (YZ01, 2018).

As such, there is no facilitation of learning-by-doing and capacity building between governmental departments and no open and objective evaluation and feedback mechanism. Energy transition in both cities is little more than implementing national targets by sectors (or departments) and a well meant but ineffective effort by the DRC to promote a local integrated effort. A shared view on a citywide energy transition is missing. To summarise succinctly in the words of a respondent:

> Low carbon city development or energy transition has an integrated nature, which involves multiple aspects. We are now impatient for the success of developing low-carbon city and only simply consider and implement it from our own departmental perspectives. Instead, a deeper and overall consideration of what kind of city can be known as low-carbon, and how to systematically make the city use less energy is not there yet (CD02, 2018).

4.5 Discussion and conclusion

Energy transition is certainly gaining importance throughout China. However, our two city cases both clearly demonstrate that policy integration at the local level is not self-evident. Interestingly, although the LCC and NEDC projects have different organisational set-ups and goals, there was little indication that such differences impact our findings. Our findings do indicate that in Chengdu problems to convince and engage other organisational were mostly an issue between the DRC and other departments, while in Yangzhou this was also already an issue within the DRC. This did not, however, result in much differences in the process of policy integration, the issues encountered or the outcomes. Hence, even though the LCC project has a broader policy goal (i.e. low carbon and sustainability) that is supposed to be supported by various policy sectors and departments; it turns out that all other relevant departments in both cities (e.g., transportation, industry, housing) still simply consider both cases as stand-lone projects solely the responsibility of the municipal DRC. The result is that, although Yangzhou even lacks a degree of ownership even within the DRC, pursuing shared visions, cooperation and integrated policy development is similarly absolute in Chengdu as in Yangzhou.

A central explanatory factor for both cases is the lack of a shared vision and approach to energy transition across various municipal departments. For one, non-energy departments foremost comply with central government targets related to energy through implementing sectoral policies. Even the LCC and NEDC projects are not considered as overarching responsibilities. This also follows from the organisation in both cities, where the local DRC, and in Yangzhou, even the energy department within the DRC are responsible. Other departments can hardly be incentivised, as there are no existing supportive policies or (financial) stimuli to convince them to join forces with the DRC. Instead, both Yangzhou and Chengdu depend on voluntarism and the convincing power of the DRC or mayor-level officials when pursuing

integrated working. An institutional culture of cooperation, however, is lacking, while experience in cross-departmental cooperation or working in interdisciplinary project groups are also non-existent. Investing time and resources and creating more local leadership to encourage a shared sense of ownership will be crucial to ensure true interaction, discussion and eventually policy integration on energy transition. As local priority is given to energy policies and awareness of a need for more integrated working is rising, there seems to be increased acceptance that such additional investments are needed. Momentum to push energy transition forward in both Chengdu and Yangzhou is apparent, but clearly, this momentum has not yet resulted in real integrated policy efforts.

Another important finding is that national policies play a key role in both promoting and frustrating climate policy integration in our two city cases. Starting with its contribution, it is evident that national efforts to integrate energy ambitions in the various departments can help, as administrative orders and rules via a top-down organisational structure can directly facilitate the integration of policies and activities at local level too (Bogdanor, 2005; Acheampong and Ibrahim, 2016). Alternatively, these national incentives do reinforce existing departmental tendencies to focus on their own departmental policy agendas and can even create barriers in advocating for cross-departmental working. Hence, our findings suggest it is worthwhile to further investigate the potential role of national policies on climate policy integration in a local context. In particular, how national policies can help the shift from a mono-sectoral policy implementation to more integrated/area-based working on energy transition. On the one hand, the central government can support local authorities by removing potential barriers such as fragmented and conflicting departmental requirements (e.g., Wu et al., 2018; Zuidema, 2017). Regarding energy transition, Dawley (2014) points out that central governments can also provide leadship and political power to 'make things happen', where various sector and departments require this 'core' to coordinate actions and form integrated energy policies at the regional and local level. On the other hand, combining national support for more integrated urban policies with (financial) resources and facilities might be worthwhile to consider. This is because equipping local authorities with adequate resources and expertise on integrated/area-based energy policies seems to be a necessary condition for improving climate policy integration at local level. This aligns with Markantoni (2016) who argues the important role of top-down funding initiatives and advice from experts in faciliting energy governance and creating the paths to a low carbon future.

While national policies are worthwhile to consider in promoting climate policy integration, we also need to be prudent in our expectations. The main problems identified in both cities relate to the local organisation of responsibilities, degrees of shared ownership, existing departmental routines and cultures, and lack of structures and processes to promote cross-departmental communication and working. That is, it is mostly a local problem. We identified a few hints that might be fruitful for further research. Local political leadership can be instrumental in creating local integrative efforts. We saw how Chengdu's local leadership has already set the stage for a more holistic and coherent approach in their discussions of energy transition policy; i.e. while not yet visible in actual actions, these discussion

might well become vehicles for pushing for more coherent policies. Hence, rather than only working through issuing energy targets through policy sectors, local political leadership can create pressure to advance climate policy integration based on integrated urban visions. Notably, there seems to be a need for creating collective ownership and a true network of collaboration to develop policies and projects that range across departmental boundaries. Essentially, there is a need for various departments to not only acknowledge a responsibility for advancing an energy transition in their cities, but also to provide leadership that goes beyond individual departments. Hence, our cases suggest that if climate policy integration at the local level is to advance, we should explicitly study the kind of top-down incentives and support that can be provided by the state in interaction with both local leadership and the limitations of capacities cities face. Ideally then, local political leadership would be combined with support and incentives from the national government to both enable and motivate local integrated and area-based working.

Theoretically, our results suggest that there is indeed an explicit need for more attention to integrated, area-based and holistic policy strategies when it comes to research and debates on energy transition. A few years ago, Coenen et al. (2012) identified that transition analyses have neglected the spatial dimension (i.e., where transition takes place) as well as the socio-spatial relations and dynamics within which transitions evolve. While the spatial dimension has gradually gained increased attention (Kempenaar et al., 2020), our study suggests that the institutional ramifications in the form or area-based and integrated approaches similarly need increased attention. Such attention has remained modest overall, but specifically when it comes to China, despite the importance of understanding how energy transition in urban China might be advanced. This study explicitly adds to such understanding, by identifying policy integration challenges with regards to energy and urban planning in a Chinese context.

Secondly, we have taken the academic debate on climate policy integration (including policy integration) into a Chinese context. Little surprising is that we confirmed that pursuing integrated policy is constrained by the current Chinese top-down oriented political system. What is more relevant is our call for considering more localised, area-based practices in pursuing integrated approaches to energy transition within an institutional environment not attuned or accustomed to such practices. Hence, our call is to further study how – in our case Chinese – cities might further experiment, develop and practice such approaches. The framework for analysing climate policy integration as discussed in our study is a good start, but does urge for further development. Notably, next to mere analytical approaches there is also a need for more prescriptive guidance, where theoretical developments fueled by empirical work can also help cities in accelerating the development or integrated energy planning approaches. In this, as we signal, the role of top-down policies as both barriers and incentives for such area-based working clearly need explicit attention.

Our findings displayed the institutional barriers and also opportunities when Chinese planning traditions and efforts to introduce climate policy integration in energy transition

practice. These insights can be helpful to many other institutional contexts which are also more centralised-based in addressing energy issues (also other cross-cutting issues), in terms of fostering planners and policymakers to widen their knowledge and vision on promoting approaches towards achieving climate policy integration.

5

Collaborative efforts on energy transition in urban China: Institutional enabling and constraining conditions

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5 Collaborative efforts on energy transition in urban China: Institutional enabling and constraining conditions

ABSTRACT

China's high rates of economic growth, industrialisation and urbanisation elevate it to the position of the largest carbon emitter worldwide. Concern about carbon has led to China's energy transition and dedication to large-scale renewable energy projects. Handling energy transition problems and implementing energy policies require integrated and collaborative strategies involving an array of stakeholders. Pursuing a successful collaboration among stakeholders is indeed complicated, particularly within China's strong top-down, regulatory policy framework. We seek to understand how current institutional rules and routines affect local energy practices, and identify key institutional barriers and opportunities for collaborative governance in local energy practices. In this chapter we opt for an expansion of the Institutional Analysis and Development (IAD) framework. In doing so, we target the informal patterns of interaction to conduct our institutional analysis through a case study of a decentralised photovoltaic (PV) power generation project in Guangzhou, southern China. We identify several key problems in Guangzhou related to the structure of Chinese energy governance that are also likely to occur in other Chinese cities. Notably in this study, we discovered important power imbalances between stakeholders, and found that the grid operators hold the monopoly position in the development of the decentralised PV project. The issue of power imbalances has triggered a chain of problems within the decentralised PV project, including financial difficulties, information opacity, and ineffective supervision. As such, these problems are major barriers to situation-specific policies that build on integrated strategies and collaborative approaches.

KEY WORDS: Stakeholder collaboration; IAD framework; Institutional analysis; Energy Transition; Urban China

5.1 Introduction

Approximately seventy percent of all energy on the planet is consumed by cities (IEA, 2016); cities are therefore key players in the transition towards a low-carbon society (Wu et al., 2018). Cities are also areas of immense diversity, with multiple land uses, activities, and social groups, creating dynamic urban spaces. Energy transition will, however, have significant impacts on urban areas by affecting land use, economic activity and social groups (e.g., De Boer and Zuidema, 2016). As such, cities require collaborative efforts among a wide range of organisations, communities, and individuals working together to make energy transition a reality (Dowling et al., 2018; Hernández-Palacio, 2017). Collaboration is especially problematic, though, as many stakeholders in the transition process are highly interdependent, spanning from house owners, energy suppliers, technology providers, project developers, to different levels of authority with various values, means, and scope of actions (Bekebrede et al., 2018). In response, many studies emphasise the role of integrative approaches, cross-sectoral communication, and multi-actor coordination in the energy transition process (e.g., Beermann and Tews, 2017; Sataøen et al., 2015; Van der Schoor and Scholtens, 2015). Although deemed important, integrative and collaborative styles of working are not necessarily common practice.

China is among the countries where integrative and collaborative styles of working are not very common. China nevertheless has high ambitions for pursuing a low fossil carbon society (NDRC, 2016). The rapid process of urbanisation in China indicates that almost 60% of its population already lives in cities. Hence, China will increasingly have to rely on local policy solutions and ideally, on more integrative and collaborative styles of working to advance energy transition. China is well-aware that implementing its national energy policies requires additional action at local and urban level for the promotion of smart grids, electric vehicles, and decentralised energy systems that run substantially on renewable energy sources (Geng et al., 2016; Sahu, 2018). Local action cannot be achieved by a single actor, such as a specific governmental department, nor should it rely only on mere top-down established policy schemes. Instead, it requires multiple interdependent stakeholder involvement in the design and implementation of local policies and actions (Devine-Wright et al., 2017; Stremke, 2012; Wu et al., 2017). Although the pursuit of energy policies in China has increasingly embraced a market-based or even a collaborative-based approach, energy policies remain predominantly designed and implemented in a top-down fashion (Cai and Aoyama, 2018; Lo et al., 2018; Schreurs, 2017; Shen, 2017). As a result, local energy policies are dominated by national targets and schemes, and largely rely on the capacity of local governmental agencies to be implemented (Wu et al., 2018). The pursuit of more collaborative efforts at local level, where multiple stakeholders try to balance different interests, ambitions and actions, is not only uncommon, but also complicated.

Pursuing successful collaboration strategies is in itself already a challenging task, typically requiring certain enabling institutional conditions and external stimuli to trigger stakeholders to act together (Ma et al., 2018). Appropriate conditions include formal institutional arrangements, e.g., political system, organisational structure and informal practices, routines and beliefs within organisations and society at large, and call for a socially shared set of self-sustaining traditions, beliefs, norms, and expectations (Andrews-Speed, 2012). As Sovacool (2014) states, institutional structures (both formal and informal) shape individual behaviours and social interactions and can both hinder and facilitate decision-making processes in multi-stakeholder settings. Hence, as Lammers and Hoppe (2019) argue, adopting an institutional perspective is advantageous for understanding the organisational structures behind the complex process of collaboration and integration in energy governance. Adopting an institutional perspective for local action can also inform us on how the development and pursuit of multi-stakeholder collaboration at local level occurs in the context of the top-down and largely government dominated energy policies in China.

Adopting an institutional perspective is still fairly novel in analyses of energy transition (e.g., Cherp et al., 2018; Newell et al., 2017; Spijkerboer et al., 2019; Turnheim et al., 2015). As Andrews-Speed (2016) notes, only a few studies explicitly focus on institutional analysis in the understanding of energy governance. Many previous studies have merely highlighted the importance of stakeholder collaboration for the quality of the energy transition process; i.e. they do not address how institutional designs might influence and structure the process of collaboration. One of the few explicit tools developed to analyse institutional design is the Institutional Analysis and Development (IAD) framework proposed by Ostrom (2011). However, the IAD framework mostly focuses on given, formal rules and routines, thereby implying it might overlook informal practices and contextual dynamics. Additionally, the few studies applying institutional analysis to energy transition are limited to specific cases in mostly Western societies (e.g., Geels et al., 2016; Lammers and Hoppe, 2019; Spijkerboer et al., 2019).

In this chapter we respond to the need for institutional analysis of cases in a Chinese context by adopting and adjusting the IAD framework for performing an institutional analysis to an in-depth case study of a decentralised photovoltaic (PV) power generation project in Guangzhou, southern China. As an advanced Chinese city, Guangzhou is pioneering the implementation of renewable energy policies. Guangzhou is expected to be relatively well-equipped with resources, strategies and abilities to handle the collaborative efforts associated with energy issues. Our first task is to explore an attempt at multi-stakeholder collaboration in the Chinese context of pursuing energy projects within a top-down organised policy programme. Since we are relying on a single case, we have deliberately chosen a city assumed to be relatively prepared because it helps us identify the constraining and enabling structures that may be ubiquitous in other less advanced cities. Our intention here, however, is not to generically conclude on the key challenges that Chinese cities face in collaborative working on urban energy issues, but rather to identify challenges in the case of Guangzhou that could provide input to also study and reflect on practices in other Chinese cities. This

brings us to our second study objective, which is to assess how an enriched version of the IAD framework will allow future analyses to add important contextual and informal variables. Thus, we reflect on how current institutional rules, routines and cultural elements affect local energy practices in Guangzhou, and identify key institutional barriers and opportunities for multi-stakeholder collaboration that could also provide input for such future studies.

Next, in Section 5.2 we present the theoretical framework for our analysis. Section 5.3 explains the research design and methodology, and includes case study selection and data used. In Section 5.4, we present our results based on the analytical framework, taking into account both the institutional barriers and opportunities for collaborative practice in Chinese energy transition at the local scale. The chapter ends with a discussion of the consequences of our findings and the impacts on institutional design in support of energy transition.

5.2 Theoretical framework

Renewables are increasingly important as part of an energy system. Their presence and potential however, are highly situation-specific. The rise of renewables and their specificities at a local level is becoming integral to energy policy. The emergence of new practices in the energy system has not only increased the number of involved actors, but has also called for more collaboration (Goldthau, 2014). New practices include, electricity, which is increasingly produced in a decentralised setting, notably using solar PV panels, combined heat and power (CHP), and small wind farms.

With the development of decentralised electricity generation (i.e. electricity production is closer to the consumer), passive consumers are turned into active 'prosumers,' and new actors are coming forth to generate energy or sell services on the energy market, e.g., developers, technology providers, prosumers, etc. (Tuballa and Abundo, 2016). New actors in the energy system also means greater complexity, notably, the increased need for effective coordination of activities and stakeholder collaboration at a local level. As such, new or updated institutional arrangements (i.e. 'the rules of the game') are also necessary to support collaboration, and provide effective means of cooperation, depending on local circumstances. Such institutional arrangements also mean coping with conflicts arising between existing and emerging actors, supporting the creation of novel business models, and more generally, answering the question, "who should be the dominant actor, how should costs and benefits be allocated, who bears which responsibilities" (Verbong et al., 2013, p. 121).

Collaboration and institutions

Scholars and policy makers accept that energy transition requires addressing complex, cross-cutting policy issues and social challenges (Mah and Hills, 2012). Although governments are traditionally responsible for pursuing 'the public good', including

regulating energy provision, the involvement of multiple stakeholders from the private and civic spheres suggests that they too are contributing to 'the public good' (Emerson et al., 2012; Ma et al., 2018; Pettersson and Hrelja, 2018). Hence, local energy transition planning and policy-making rely increasingly on interplay among various actors.

Ideally, such an interplay among various actors results in collaborations with desirable outcomes for all involved. Collaborative planning (CP) emerged in the 1990s as a response to deficiencies in traditional planning approaches that depend on the central role of an expert, and produce often technical-based standards and blueprints (Gunton et al., 2006). The main deficiency of traditional approaches was the inability of the experts to harmonise inter-stakeholder conflicts while relying on fragmented sectoral policies. CP is defined as a collective process for resolving conflicts and reaching agreement on plans involving a wide spectrum of stakeholders working together through, ideally, equality-based dialogues (e.g., Osman et al., 2018). Such collaborative efforts are normally dealt with in a holistic and multi-disciplinary manner and try to achieve 'win-win' solutions, or at least reconcile opposing views by reflecting and respecting different interests and visions among many stakeholders (Cullen et al., 2010). Moreover, it is often essential to involve these stakeholders, given their necessary input, resources and their power to obstruct. Working in multi-stakeholder networks ideally can be effective in replacing or complementing (centralised) governmentally-dominated policy efforts. Nevertheless, the pursuit of successful collaboration is not self-evident. For one, it demands an 'open', flexible organisational structure, rather than an administratively hierarchical one. An open structure allows participants to freely discuss and pursue their own goals while contributing with resources and expertise (Ansell and Gash, 2017; Ma et al., 2018; Pettersson and Hrelja, 2018). Secondly, successful collaboration demands a process that allows for sharing information, responsibilities and decision-making, and relies on developing a common understanding of policy issues and ambitions through the use of coordination tools (e.g., plans, regular meetings, committees, and workshops) (Foster-Fishman et al., 2001). Thirdly, an effective collaboration must grant specific actors the power, resources, and knowledge to direct, influence and enact the collaboration's agenda, and be accountable for their activities (Vangen et al., 2015).

All the conditions for a successful collaboration imply that a group of stakeholders (e.g., residents, government, developers) are empowered and enabled to actively help develop plans and resolve policy issues. However, collaborative efforts between stakeholders are influenced or defined by an institutional context of rules and practices which a priori shape the behaviour of actors and also influences policy implementation. The institutional contexts determine by and large, for example, who can participate in the network, what actions are permitted, and can even allocate power and decision-making procedures. In other words, the institutional context also shapes whether attempts at pushing for multi-actor collaborations succeed in truly allowing for shared agenda setting, decision making and project implementation.

Institutions are often referred to as 'the rules of the game', or as any form of human-devised rules that structure social interaction (North, 1991). As Siddiki et al. (2015) suggest, institutions are the rules, directives and social norms that "specify what people may, must, or not do under various temporal, spatial, and/or procedural parameters when operating in certain settings" (p. 537). Institutions are expressed in formal and informal rules and structures. Formal rules are explicit and enforced through government channels and organisational structures; they encompass laws, regulations, constitutions, contracts, and policies. Informal rules are socially-shared rules, implicit and usually unwritten, but which are deeply embedded in society, such as norms, traditions, customs, beliefs, and expectations (Helmke and Levitsky, 2004; North, 1991). The design of many countries' formal institutions lies directly under the influence of the state, e.g., political and legal system, judiciary, and bureaucratic structures of government. The state establishes formal rules by clearly regulating, for example, how power is distributed, which individuals are allowed to participate in an action, and how such rights are exercised (Holmes Jr et al., 2013). These formal rules can facilitate the formation of behavioural expectations through setting authoritative guidelines. However, they can also provide negative incentives for actions; favouring certain groups while disadvantaging others is a primary example, given that they are the key instruments and structures in the distribution of resources and power in society (Mahoney and Thelen, 2010). Informal institutions also influence (both restrict and encourage) human behaviours, as they provide "a metaphysical incentive in the sense that people want to act in a particular way because they are persuaded that they are right" (Dobler, 2011, p.16). These informal institutions can include norms such as social customs, use of language, political ideology, and culture. In many ways, informal institutions also structure behaviour by being part of a particular belief system (e.g., religious or other metaphysical beliefs) which may be deeply embedded in culture and language.

In China, several informal rules have established themselves in a particular 'system' of conduct that influences policy development and implementation, and is commonly referred to as *guanxi*. The interpersonal relationships among network parties in the expectation of a material or interest return, *Guanxi*, is an important informal institution in Chinese collective society (Chen et al., 2017). *Guanxi* is also perceived as a type of relationship (or connection) between individuals and organisations that revolves around trust building and knowledge-sharing in a Chinese context, and aims to secure favours in personal or business relations (Luo, 1997). Specifically, *guanxi* involves personal level emotional attachment and organisational level favour exchanges (Langenberg, 2007). Practices of *guanxi* flourish in China, especially as a result of the rapidly emerging industries that seek to access valuable resources, obtain crucial information, and 'get things done' much easier in the market, rather than adhere strictly to business regulations (Wang et al., 2019). *Guanxi* is particularly prevalent where formal institutions are underdeveloped. Although the goal is to 'get things done', *Guanxi* can also breed clientelism, corruption, and unfair competition (Zhan, 2012). In institutional contexts characterised by ill-defined practices, pioneering, and a relative lack of formal frameworks, *Guanxi* risks becoming a dominant and potentially adverse force in policy development and delivery; i.e., a risk that also exists in the attempt to build collaborative

practices in the realm of urban energy transition. Despite the existence of mature formal institutions involved in energy transition, *guanxi*, as an ingrained institution originating from Confucianism, a Chinese social philosophy that has influenced the belief system of Chinese society for more than 2,500 years (Qian et al., 2016), can still play a purposeful role by manipulating exchanges in the Chinese decision making processes, both allowing for and constraining collaborative practices.

Analytical framework: Enriching the IAD framework

One of the few frameworks developed for analysing institutions is Institutional Analysis and Development (IAD) by Ostrom (2011); this framework provides an analytical lens for studying how institutions affect the interplay among actors in multi-stakeholder settings. The IAD framework therefore demonstrates the potential to also systematically analyse collaborative efforts in pursuing local energy projects in China. Moreover, it is one of the few frameworks that, by following a systematic set of rules, structurally elaborates the action situation relevant to policy actors (Ostrom, 2011, 2009). An 'action situation' is the focal point of the IAD framework, which is defined as "the social spaces where individuals interact, exchange goods and services, solve problems, dominate one another, or fight…" (Ostrom, 2011, p. 11).

The action situation in our analysis is a local energy planning process initiative in Guangzhou, China, where various actors collaborate to implement renewable energy projects. The IAD framework attempts to capture all the possible rules associated with the main components of an action situation (e.g., actors, action, information, and potential outcomes) that would directly affect the choices, attitudes and behaviours of actors (Fig.5.1). These rules determine, for example, who and what are included, what actions can and cannot be taken and in what sequence, and who decides or permits actions in a policy making venue. Such rules are classified into seven different types in the IAD, also known as 'rules-in-use', which are explained below (Ostrom, 2009).

1) *Position rules:* specify the set of positions or roles that actors hold in an action situation;
2) *Boundary rules:* specify who may enter or leave positions and how;
3) *Choice rules:* specify what a participant occupying a position must, must not, or may do at a particular point in a decision process;
4) *Information rules:* specify the amount and type of information available to participants and how this information is used and shared;
5) *Aggregation rules:* determine 'who is to decide' which action or set of activities is to be undertaken;
6) *Payoff rules:* specify the costs and benefits that are paid or received by actors;
7) *Scope rules:* specify which outcomes may, must, or must not be affected within a situation.

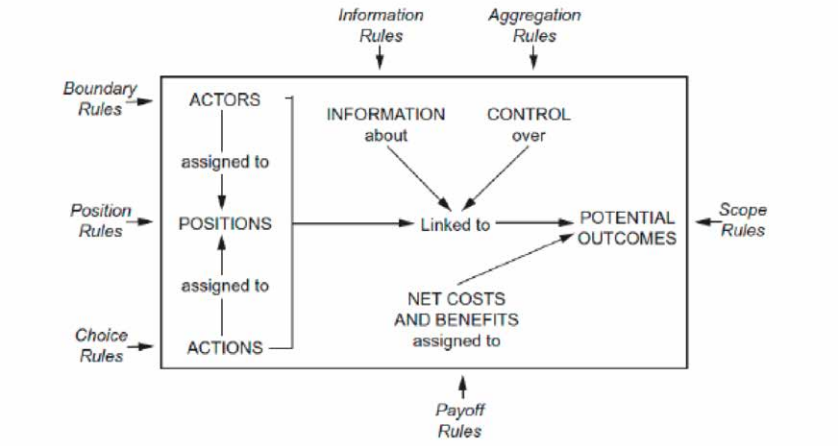

Figure 5.1 The action situation with their respective 'rules-in-use' (Ostrom, 2011)

Although the IAD framework shows the potential for analysis of collaborative efforts on energy transition practices, it also raises doubts. For instance, the IAD framework is criticised for being both ahistorical and apolitical, according to Whaley and Weatherhead (2014), "giving too much precedence to rules and the way in which rules operate to shape and constrain human behaviour, while failing to adequately …consider contextual variables" (p. 4). Furthermore, the IAD itself has also been criticised for over-simplifying the complexity of human relationships (Clement, 2010). McCay (2002) argues that explaining how people make decisions and undertake actions also requires an understanding of how rules emerge from and are used in particular historical, ecological, political, and cultural traditions. These contextual variables, which include informal routines, implicit practices and power dynamics, cannot be fully captured by the IAD framework (e.g., Ribot et al., 2006; Brisbois et al., 2019), since it presents institutions largely as given, or formal entities shaping actors' strategies and behaviours in an action situation (Mahoney and Thelen, 2010). Nevertheless, actors' behaviours and resultant action situation outcomes are not only affected by formal institutions (through the 'rules of the game'), but are also shaped by interactive, informal practices through, e.g. what, when, how, and why rules are applied by actors in real life (Table 5.1). Importantly, in the expectation that *guanxi* will play a role in shaping collaborative planning in Chinese urban energy projects, we have also chosen to enrich the IAD framework to better capture contextual influences and the 'play of the game'.

We draw on the Spijkerboer et al. (2019) application of the IAD framework, which considers the role of contextual practices, informal routines and interactions in addition to how the 'play of the game' complements and also transforms the 'rules of the game'. In doing so, this enriched version of the IAD may provide a more comprehensive understanding of how actors cope with institutional barriers and opportunities encountered, notably by altering previous routines and common ways of working. Doing so also allows for the study of possible mismatches within and between the 'rules of the game' and the 'play of the game'. For example, rules can be contradictory within the 'rules of the game', or actors' current or

new behaviours through 'the play of the game' might deviate from the 'rules of the game'. In particular, new behaviours might emerge where 'institutional space' (Spijkerboer et al., 2019) is sought within the formal rules of the game through using or altering previous informal rules and related routine behaviours. These informal practices and routines and *how* the game is played in actual life can be examined by asking *how* are actors involved; *how* are decisions made; who/what is *decisive*; and *how and why* is information shared (or not shared). These questions do not simply target the 'rules of the game', but shift focus to also include the 'play of the game' in our analysis. Hence, in addition to the 'rules of the game', we expand our analysis by a wider operationalising of the IAD framework as our analytical tool. Table 5.1 presents how we have expanded the existing focus on the 'rules of the game' (IAD framework) into questions that also aim to capture the 'play of the game'.

Table 5.1 Analytical approach for studying both the 'rules of the game' and the 'play of the game' (based on Ostrom, 2011; Spijkerboer et al., 2019)

Rules of the game	'Play of the game' and the questions that follow
Boundary rules: who may enter or leave positions	• Which actors are involved? • How are actors involved? • Who is not involved but should be, and why are they not involved? • Why these actors, and who influences decisions on involvement?
Position rules: positions or roles held by actors	• What do actors in certain positions want or need? • Why do these actors have these wants or needs? • How do the wants and needs of actors relate to each other?
Choice rules: what actors in certain positions may, must, or must not do at certain points	• Which choices do actors in certain positions have? • Which actions do actors undertake and which strategies do actors employ to achieve these actions and why (which considerations play a role in these strategies, for example knowledge, experiences, habits, competencies)?
Aggregation rules: who is to decide which actions or set of activities is to be undertaken	• How are decisions made and who/what is decisive and why? • How much room for decision-making do actors have, and how do they seek to expand this?
Information rules: what information is to be sent and received by which actors at what moment	• What information is shared (or not shared) between which actors, how, why and when (at what stage)? • Does this happen? (Including the presence of feedback mechanisms to evaluate and learn from experiences)
Scope rules: the potential outcomes of the action situations	• Which (types of) results/outcomes are considered? • Which frameworks and (informal) practices influence these results/outcomes? • What room is left for actors to deviate from these outcomes? • To what extent are outcomes linked to actions?
Payoff rules: the benefits and costs assigned to actors in light of outcomes	• How are costs and benefits distributed among actors and which costs and benefits are deemed acceptable (and why?)

5.3 Case study and methods

Empirical case

The analysis in this chapter addresses a case study of the city of Guangzhou. Guangzhou is the largest city and political, economic and cultural centre of southern China; it is located in the central part of the Pearl River Delta, one of the most productive economic areas in China, and is adjacent to Hong Kong and Macao (Fig. 5.2). By 2018, Guangzhou's per capita GDP was USD 21,390 and the total population exceeded 14.49 million (Guangzhou Statistical Yearbook, 2018).

We chose Guangzhou for two main reasons. First, Guangzhou is one of China's four major highly developed first-tier cities (the other three are Beijing, Shanghai and Shenzhen), and is therefore expected to be well-equipped with resources (i.e., expertise, financial resources, technology, etc.), strategies and abilities to implement energy policies. Second, alongside national policies for decarbonisation, in regard to the implementation of energy policy, Guangzhou is a pioneering city. Guangzhou has been actively participating in various national and local energy transition projects, emphasising renewable energy use and management (e.g., smart grids, decentralised PV power generation and wind power generation) (Guangzhou General Office, 2017). As a result, the Guangzhou municipal government can be considered a frontrunner in energy transition in China. Hence, Guangzhou can be assumed relatively well equipped to develop and push for more novel collaborative planning efforts in the field of energy. This allows us to assess if such a collaboration can prosper in a country dominated by top-down organised energy policy programmes.

Within Guangzhou we specifically look at its participation in the national pilot project, "decentralised photovoltaic (PV) power generation". The PV power generation project was launched by the National Energy Bureau (NEB) in 2012, with the aim to scale up the application of decentralised renewable energy, and thereby explore adaptive management practices and operating models that could be applied in other Chinese cities (NEB, 2012). In 2013, the Chinese central government financially supported 18 industrial parks nationwide as the first batch of demonstration areas for decentralised PV use; Guangzhou Mingzhu industrial park in Conghua District, the case study of the present paper, was also included (NEB, 2013a). Our case involves a project that aims to bring together a variety of mutually dependent stakeholders in an ambition to both develop and implement the PV project in Mingzhu industrial park. There was a distinct attempt for these stakeholders to joining forces in setting an agenda for developing and implementing this project.

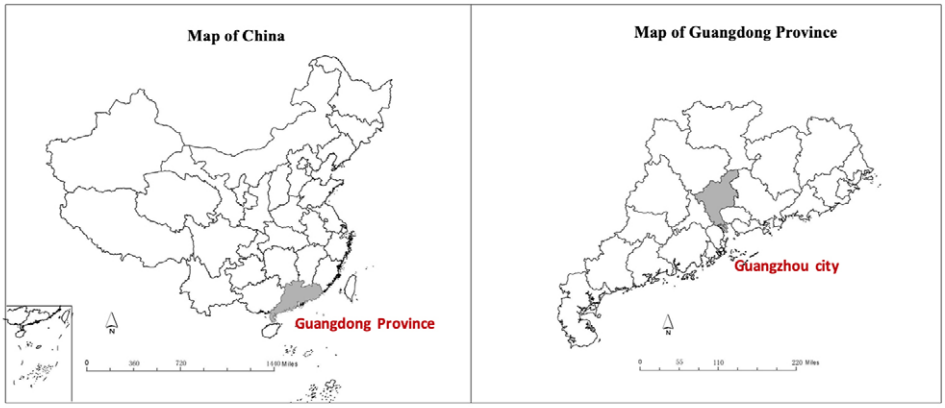

Figure 5.2 Location of the case study in China (Source: Authors)

Data collection and analysis

The case study is based on two different sources to validate the findings. For one, we carried out an in-depth analysis of policy documents and reports to identify the rules, procedures and measures involved in the setting up of the project, taking account of the roles and perspectives of the range of participating actors (Table 5.2). Second, a total of 16 in-depth, semi-structured interviews were conducted in June of 2019. The interviewees were directly and indirectly involved in the project. Respondents can be categorised as government officials, developers, investors, end-users, and scholars (Table 5.3). Interview questions were guided and organised according to the rules structured by the expanded IAD framework discussed in Section 2 (also see Table 5.1). Collected data were qualitatively coded using Atlas.ti. The coding scheme was derived from the IAD framework discussed in Section 2 (Appendix D, Table A1, Table A2).

Table 5.2 List of coded documents

Issued agency	Document and report name	Code
State Council	Regulations on the PV manufacturing industry (2013)	D1
NDRC	Interim measures on distributed generation (2013)	D2
NEB	Notice on the interim measures of the decentralised PV power generation projects (2013b)	D3
NEB	Notice on constructing distributed PV power generation demonstration area (2013a)	D4
NEB	Comments on the support of distributed PV power generation by financial services (2013c)	D5
Ministry of Finance (MOF)	Notice on subsidy policies of distributed PV power generation (2013)	D6

CSG (China Southern Power Grid)	Service guidelines on distributed PV power generation (2013)	D7
Guangzhou DRC	Guangzhou 13th FYP of energy development (2016)	D8
Guangzhou DRC	Guangzhou's regulations on distributed PV power generation projects (2014)	D9
IEA	Outlook on China's distributed energy (2017)	D10
China Energy Research Institute	Study on the policy roadmap of distributed PV power generation in China (2015)	D11

Table 5.3 List of interviewees

Type of interviewee	Organisational Affiliation	Code
Government officials (n=3)	Municipal energy department	I1
	District development and reform committee	I2
	Mingzhu industrial park management committee	I3
Developer (n=4)	Guangzhou development group incorporated	I4, I5
	Construction company and technical service providers	I6, I7
Energy company (n=5)	China Southern Power Grid	I8, I9
	Other non-state-owned energy companies	I10, I11
Scholars (n=2)	Sun Yat-sen University	I13
	Chinese Academy of Social Science	I14
End-users (n=2)	Local companies based in Mingzhu industrial park	I15, I16

5.4 Empirical findings

The case study project, Guangzhou Mingzhu Industrial Park, is the biggest industrial park in Conghua District of Guangzhou at the moment. Its total planning area is 51 square kilometres and currently its built-up area is 12.37 square kilometres with more than 130 enterprises residing in the industrial park. The PV installation in this park is only meant for rooftops and was designed to achieve 83 megawatts (MW) installed capacity by the year 2015. The local enterprises within this park hold the ownership of their rooftops with full disposal of its rights. They are incentivised to join the PV project through subsidies provided by national government and Guangzhou municipal government.

Identifying stakeholder interactions

Fig. 5.3 presents the general 'action situation' for the project of decentralised PV power generation in Guangzhou Mingzhu Industrial Park. It shows the involved key stakeholders and their collaborative interactions in the implementation of the project.

As part of the National Development and Reform Commission (NDRC), NEB is in charge of overseeing and supporting the progress of approved pilot industrial parks by coordinating policies and issuing regulations. The Ministry of Finance provides subsidies to each PV project developer and subsidies are based on the amount of electricity production. Although the approval of setting up the project is granted by the NDRC in a top-down fashion, municipal DRCs are given a relatively high degree of autonomy in designing their own policies to implement the project. Guangzhou DRC (including Conghua District DRC and Mingzhu Industrial Park Council) as executive agency for the project implementation, takes responsibility for making strategic plans, negotiating with relevant governmental sectors, tracking project performance, and receiving feedback. It also encourages enterprises to participate in the project as investor or developer through incentive policies (e.g., additional subsidies) and active publicity. In addition, Guangzhou DRC also acts as the licensing authority for the permit of market access to participants.

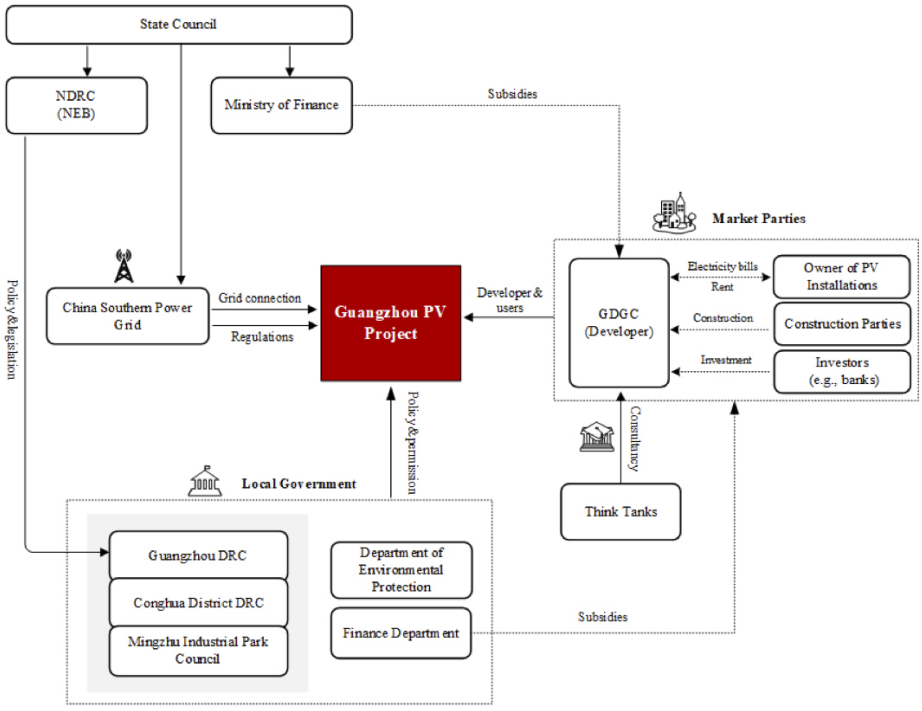

Figure 5.3 Overview of the actor network present in the Guangzhou decentralised PV

Guangzhou Development Group Corporation (GDGC) is the developer taking charge of participating in the investment, operation, management, and maintenance of the entire solar project. Its work includes a pre-project feasibility study (e.g., technical, financial) consulted by university-based research institutes and think tanks (e.g., Sat Yet-sen University), negotiating and signing the contracts with owners of PV installations, seeking potential investors (e.g., China Development Bank), cooperating with construction parties, and applying for an environment permit from the Municipal Department of Environmental Protection (DEP). After completing the construction, the developer may apply for the grid connection from the local grid operator, i.e. China Southern Power Grid (CSG), one of the two large state-owned monopolised electric enterprises in China. Both the developer and the owners of PV installations (i.e., local companies within the industrial park) may also apply for extra subsidies from the Guangzhou Finance Department when the project is in actual operation.

Institutional barriers of collaborative practices

The next subsections will discuss the three main patterns of findings from our coding analysis, thereby allowing us to identify the barriers and opportunities experienced. Direct reference is made to the rules as expressed in the IAD framework (complete overview given in Appendix D, Table A.1 [rules of the game] and Appendix D, Table A.2 [play of the game]).

The monopoly position of grid operators

There are two large state-owned monopolised grid operators in China: the State Grid Corporation of China (SGCC) and China Southern Power Grid Co. Ltd. (CSG), which account, respectively, for 88% and 17% of the national power consumption (Brunekreeft et al., 2015). CSG's market covers China's five southern provinces (e.g., Guangdong, Guangxi, Yunnan, Guizhou, and Hainan), while SGCC serves the rest of the provinces and regions of China. These two grid companies control all electricity transmission, distribution and retailing in their respective regions; however, electricity generation is open to the private sector (Wu et al., 2018). Meanwhile, they share a ministry-like status and play an influential role in the policy making process of energy issues. Our findings make it clear that this dominance has contributed to some serious problems that the decentralised PV power generation project has been facing.

To begin with, surplus renewable electricity cannot be sold on the market to a variety of potential consumers, but instead has to be sold to grid operators. As choice rule C9 shows (Table A.1), Article 25 of Chinese Electric Power Law stipulates that only one power retailer is allowed to be in a certain service area: either CSG or SGCC. The implication here is that, in Guangzhou's case, surplus electricity produced by solar panels is not allowed to be directly supplied to consumers who are in need of electricity and are close to Mingzhu Industry Park; nor can electricity be sold to retailers. The central government has realised this problem and actively pushed for electricity market reforms in recent years. In March of 2015, the

State Council expressed in its Document No.9, setting out the guiding principles for the liberalisation of the wholesale and retail electricity market, that the two grid operators would control only the power transmission segment (State Council, 2015). This reform ambition was further highlighted in *Notice on the trial of decentralised power generation trading,* in which local governments are greatly encouraged to develop their own reform policies for electricity; this clearly weakens grid companies' monopolies in the energy sector, and allows non state-owned wholesale electricity companies to enter the market (NDRC, 2017). These new regulations have triggered active responses from local governments. Several provincial and municipal governments have become demonstration sites for electricity reform. However, nationwide there is still much ongoing bargaining and limited progress has been made in the process, in particular regarding the role of the two grid operators in the new system (I13/ I14, 2019). CSG and SGCC are resistant to structural change in the electricity sector and the retailing segment has not yet been opened to the market. In addition, local governments indicated they have lower executive power in the electricity sector than grid operators because of the ministry-like status of the grid operators. Therefore, even though Guangzhou has aggressively carried out its own electricity reform plans as shown by the analysis of scope rule S2 (Table A.1), we can see from its 'play of the game' (Ps3, Table A.2), that direct trading of surplus renewable electricity between generators and end-users is still not realised.

Another problem encountered by the entire decentralised PV project is the negative attitude (reluctance or even rejection) of grid operators to establish grid connections. It is particularly noteworthy during the early stages of this PV pilot project, since there were no clear rules defining the responsibilities of CSG and SGCC with regard to making grid connections until 2013. After 2013, motivated by political obligations and social responsibility, the two grid operators started to introduce grid-connection related procedures, regulations and standards (also position rule Pp3, Table A.2). As we can notice from choice rule C7 (Table A.1), one of the most significant regulations was published by CSG in November of 2013; it stated that CSG must provide free-of-charge connection services (e.g., grid-connection plan design and construction) for decentralised PV electricity within 38 to 58 business days once the connection application is accepted. Nowadays, grid-connection for rooftop PV projects, such as our case study project, in general goes well in Guangzhou. Nevertheless, for ground PV projects, the grid-connection still often cannot be fulfilled within the prescribed period. "It always takes much more time than we expect, either our application or the connection service gets postponed. Sometimes it took us a year to realise it, which would largely influence our profitability" (I5, 2019). Furthermore, choice rule Pc5 (Table A.2) indicates that success in getting a timely grid-connection is influenced by how close the *guanxi* relationship is between developers and the grid operator. "It would not be a big problem for us as we are the local state-owned development enterprises. CSG is also the state-owned company, so it is relatively easier for us to always keep a good relationship with them; however, it could be difficult for local private investors" (I4, 2019). In other words, local PV projects are easier for government-owned initiators, thus reinforcing a government dominated planning process.

Our analysis of the 'play of the game' (boundary rule Pb2, Table A.2) also reveals that the grid operators can make use of their dominance to squeeze out other competitors relatively easily, as they occasionally act as a developer participating in a competition with other potential investors to acquire the development rights for decentralised PV projects. As a respondent in Guangzhou remarked, "Now that you (the grid operator) act as a referee, then please do not work as a competitor at the same time" (I10, 2019). This condition makes the inequity even more serious. One of our respondents complained, "We are always in an arranged position and have limited space for decision-making, no matter the grid-connection, generation dispatching or infrastructure construction. Of course, you can go to the court, but we do not want to spend too much time in court instead of doing another business. Thus, you might not have better solutions if they delay the approval of requests on grid-connection, or forcibly interrupt the power supply during their overhaul period" (I6, 2019; also choice rule Pc6, Table A.2). Hence, local government might formally have powers to urge grid operators to act, but in practice is forced to largely rely on the grid operators: "We often collect and report these problems to the central government, only which has the greater power to negotiate with grid operators and have the final say in these issues" (I1, 2019).

Information sharing and supervisory authorities

Poor transparency of information sharing among stakeholders also constrains the collaborative practice in the decentralised PV project. First, essential information related to grid-connection capacity is not shared with the public. Each year there is a planned grid-connection capacity available, mainly decided by NEB and the grid operators. By doing so, these actors agree on how much electricity from renewables can be accepted and connected to the grid. After this agreement, NEB must officially publish these targets and assign them to lower levels of government who can then adapt their actions to these amounts. According to information rule I1 (Table A.1), municipal government and grid operators also must regularly publish the information of available grid-connection capacity at the local level to the public. Nevertheless, as rule Pi1 ('play of the game') shows, published information is limited to the overall planned target of annual grid-connection capacity, implying that information on the amount of capacity used and is still available is not routinely updated and publicly shared. As a result, investors must try to get this information by *guanxi* before investing: "You would get the information if you have a good relationship with CSG; otherwise it would be hard to get any" (I6, 2019). This phenomenon is resulting in unfair market competition and instigating unfavourable consequences, such as rent-seeking, which affects investors' decisions and ultimately the development of the decentralised PV power generation project. It seems necessary to have an official information-sharing platform for the whole decentralised PV industry which would provide both details of a specific project (e.g., annual generating capacity) and operational abilities of developers. At present, this information is kept by grid operators. The lack of an information platform further hampers investment behaviours because investors (including banks) cannot properly assess if a PV project is a worthwhile investment.

Second, the evaluation standards regarding how and which project can receive national subsidies are also not shared with the public. NEB sets an annual target on expected installation capacity for the whole decentralised PV industry, and local governments are responsible for local targets. Since May of 2018, NEB stipulated that only the PV projects constructed *within* this given target range are eligible for national subsidies (NDRC, 2018). With an abundance of projects, developers compete for information to ensure their PV installations are eligible for subsidies. As rule Pi2 (Table A.2) shows, investors use *Guanxi* to try to get this qualification, thus raising the possibility for corruption and manipulation. This lack of transparency in information has affected our case study project. As position rule P3 and boundary rule B3 (Table A.1) indicate, obtaining the development rights of the project is based on competition on price and a feasible proposal. In practice, as rule Pb1 (Table A.2) suggests, there was no open bidding procedure or competition. Instead, Guangzhou DRC specifically chose GDGC as the developer of this pilot project without explicit sharing of information to the public. As our respondent of an energy company remarked, "The reasons that local government chose GDGC might be considering its strong development capacity or maybe they have a good relationship (*Guanxi*), but we are not exactly sure about this" (I10, 2019).

Information opacity, combined with reported unfair competition and delayed grid-connections, should have prompted action from supervisory authorities regarding renewables project implementation (position rule P8, Table A.1). According to regulations, for example in *Guangdong regulatory measures for electric power market,* Guangdong DRC, Guangdong Economic and Information Commission, Guangzhou DRC and South China Energy Regulatory Office are responsible for monitoring activities in the electricity market (SERO, 2017). Nevertheless, (rule Pp4, Table A.2) there is an ambiguous division of tasks and responsibilities among these supervisory authorities, for example, who is exactly in charge of what? What activities should and can be supervised? To illustrate, as a developer states: "There are no clear regulations issued for supervision or for punishing those that break the rules. For example, when the policies request a grid-connection service needs to be completed within a half year, and if the grid operators could not make it, then who can punish them?" (I5, 2019). Furthermore, interviewees question whether local authorities can supervise and be a check on grid operators' power, given their ministry-like political status. "The two grid operators have almost the same status as NEB, and I don't think local authorities can truly supervise their behaviours and balance their power" (I14, 2019). Furthermore, concrete penalties are not always explicitly stated regarding punishable actions in the electricity market. Numerous complaints have arisen, as, "How and who could punish grid operators, for example, when they purposely put off the grid-connection, is still unclear in the regulations. Policy implementation would be more successful with effective supervision measures" (I5, 2019).

Other problems: subsidies, finance and interest conflicts

There are noteworthy barriers in central governmental subsidies for decentralised PV projects. Our interviews revealed that the payment of national subsidies across the whole

of China is often delayed, despite formal rules (D6, Table 2) explicitly guiding the procedure and timeline for dispensing national subsidies (also rule P6, Table A.1). Our respondents remarked how distributing subsidies on time can even determine success or failure of a PV project. "Generally, the payment of national subsidies can be delayed over one year, which can easily cause tensions in the capital chain. Influenced by this problem, some small and medium-sized energy enterprises had to sell assets or shares" (I6, 2019). The problem is exacerbated by the complicated application procedure. More importantly, the problem of subsidies points to a conflict of interest between central government and local government regarding installation capacity of PV electricity generation. Although NEB has an annual target, local governments are generally more active in fostering PV construction and some even adopt the first-come-first-served policy: as long as the PV project meets the construction conditions, it can be granted a permit by local governments (I14, 2019). This criterion has caused uncontrolled and excessive development of PV projects, far outnumbering the available subsidies (Ps5, Table A.2). For instance, total PV installation by December 2018 reached 174 GW, thereby already fulfilling the plan for year 2020 (105 GW) (NEB, 2019).

Furthermore, there is a mismatch between the expectation of developers regarding the steady decline of national subsidies compared to actual declines. The reduction in national subsidies is meant to urge decentralised PV projects to no longer rely on subsidies (see Pc4, Table A.2). Although developers are aware of the trend, its suddenness and speed of changes has resulted in numerous complaints and decreased enthusiasm for PV investment. In particular, they were concerned about a new subsidy regulation issued on 31th May 2018 (i.e. '531' New Deal), which suddenly reduced national subsidies without negotiations (NDRC, 2018). As a respondent said, "The power of decision-making on changing subsidies is all with the central government… the subsidy in 2013 was 0.42 yuan/kW h and declined to 0.37 yuan/k W h in 2017 and now is only with 0.33 yuan/k W h. We all have a certain expectation for the decrease of national subsidies; however, we could not expect this '531' New Deal comes out this sudden, which would largely affect our earnings" (I10, 2019).

In addition to problems with subsidies, the Mingzhu project also suffered from a mismatch between the investment cycles of rooftop-owners and those of PV developers. Rooftop PV projects are generally based on a 20-year investment period and require a sufficient number of potential participating rooftop-owners (companies). Rooftop-owners, however, rarely plan so far in advance, so are reluctant to rent out their roofs (rule Pp2, Table A.2). Considerations include the security of roofs (e.g., load bearing, leakage), rent and electricity price. Developers also worried about some rooftop-owners operation ability (e.g., risks of bankruptcy and losses) and credibility to continuously pay electricity bills for 20 years+ without default (choice rule Pc7, Table A.2). These concerns and potential risks made developers hesitate to do business with rooftop-owners in 2013, leading to a one-year delay on PV installation in Mingzhu Industrial Park. This delay moreover was also caused by developers having only one business model for electricity revenue until 2014. The model urged electricity to first be sold to rooftop-owners, and only surplus electricity could be sold to grid operators; i.e. a dependency on the rooftop-owner existed. After 2014, all

produced electricity can be sold to grid operators (scope rule S3, Table A.1); with this new model, developers no longer worried about electricity revenue, even though its profits had decreased.

A forementioned barriers on decentralised PV projects also urged financial institutions (e.g., banks, insurance and security companies) to take a 'wait-and-see' attitude, and provide fewer loans to developers (see Pc8, Table A.2). Although not onerous for state-owned energy companies with strong assets, is nevertheless a major impediment for small and medium sized developers because they lack sufficient guarantees (see Ps4, Table A.2). Once again, reliance on the leading role for government institutions is reinforced.

Enablers and stimulations for stakeholder collaboration

Despite institutional barriers, several incentives and enablers for stakeholder collaboration exist. To begin with, position rule Pp1 (Table A.2) shows that besides national subsidies, Guangzhou municipality also provides subsidies to developers and rooftop-owners. As a staff-member of GDGC says, "Guangzhou even subsidises rooftop-owners, which is uncommon in many other Chinese cities and is helpful to motivate them to rent out rooftops and meanwhile effectively stimulate our willingness on PV investment" (I5, 2019). Secondly, Guangzhou DRC and other governmental sectors have simplified approval procedures for decentralised PV projects, for example, in issuing permits on environment, energy saving, land use, and construction. Also, Guangzhou DRC on behalf of end-users and developers frequently negotiates with the local CSG-branch to get better services on grid-connection. Although local governments have limited power to deal with essential problems (e.g., electricity trading), Guangzhou municipality often interacts (e.g., workshops, meetings) with relevant stakeholders to gain immediate feedback on project implementation and report to upper levels of government, or fix issues when possible (see information rule Pi3, Table A.2).

Finally, Guangzhou has a rigorous permit procedure for fossil fuel projects to restrict their development and push enterprises to invest in renewables (see Pc2, Table A.2). With the same aim, central government has a compulsory regulation that, each year, all state-owned power generation enterprises must have a certain proportion of investment on renewables-based electricity projects. More state-owned power generation enterprises are now participating in the decentralised PV industry, thus opening higher grid capacity for renewables. Central government commitment can also produce positive outcomes. To illustrate, as a government official remarked, "The two grid operators rejected to connect renewables electricity into grid a few years ago since they did not receive benefits but extra work. This problem has been gradually resolved once they got regulations and administrative pressure from the State Council" (I1, 2019).

5.5 Discussion and conclusion

The rise of renewables has urged for the development of new local practices in the energy system, many of which depend on effective stakeholder collaboration and new, reframed institutional arrangements that allow for collaboration. The present chapter has analysed how such a situation specific stakeholder-collaboration on energy issues is pursued in Guangzhou, and how it interacts with existing state-dominated institutional frameworks and large monopolistic state-owned companies. Furthermore, we attempted our analysis using an enriched version of the IAD framework.

Including a focus on the 'play of the game' rather than merely the 'rules of the game' thus enriching the IAD framework, has proven useful. It allowed us to see and interpret several essential contextual influences and informal practices in how collaborative energy projects were shaped and implemented. Such nuances would not have been seen if only Ostrom's rules had been followed. Informal practices are deeply embedded in existing traditions, routines, culture, and power dynamics, and certainly proved relevant in our case study. Notably, we found that, in order to get a timely grid-connection, energy developers in our case often make use of *Guanxi* with grid operators to 'get things done'. *Guanxi* is an important informal practice and cultural tradition often observed in Chinese business society, but it is not easily captured by the original IAD framework. As our case convincingly shows, *guanxi* might well play a key role in shaping actors' behaviours and decisions in collaborative work on energy projects. The addition of a focus on the 'play of the game' to the IAD framework, as we found, can bring to light informal or contextual variables in collaborative practices.

In the pursuit of collaborative efforts, the Guangzhou project case study has uncovered several institutional constraints and opportunities, the main one being the dominant position of grid operators (CSG and SGCC). As many scholars have argued, power sharing between stakeholders in the decision making process is a key condition to collaborative practice (e.g., Jung et al., 2015; Savage et al., 2010). Parity among stakeholders allows all voices to frame the problem, seek consensus, and shape solutions together through recognition of the best competencies of participants. But this study shows that the monopoly power of grid operators is well displayed in position, choice, aggregation, and information rules, as CSG still can unilaterally decide when and to whom to connect renewables electricity to the grid. Although its power is formally limited by obligations and supervisors, informally it remains almost solely in control. Clearly, if one single stakeholder has excessive power and resources, others cannot openly or easily communicate, negotiate or work. We found that even local governments are limited in dealing with problems closely related to grid operators' essential interests, and instead reported them to central government. For end-users and developers, there were even fewer possibilities to respond to CSG decisions. An uneven collaboration has also shed light on the relationship between government and developers with regard to information sharing and subsidies. Such a lopsided position between actors leads to several major implications.

First, it can hinder innovation and reform. Our case illustrates how little progress has been made in changing practices, even though Guangzhou municipality has actively pushed forward local electricity system reform. So, even a proactive, well-equipped and large city has problems pushing for innovations in the face of existing practices and power positions. Second, imbalanced power can largely weaken the influence of supervisory authorities on stakeholder performance and behaviour during the decision-making process. The situation only worsens if the supervisory authorities are not clear about their own roles and responsibilities in project implementation, as our findings have shown. Combined, these challenges have a ripple effect that has negatively impacted the attitudes of other actors in the development of decentralised PV projects. Examples of this include financial institutions (e.g., banks, insurance companies) that have taken a 'wait-and-see' attitude and are generally reluctant to provide loans to developers. As these circumstances are not confined to Guangzhou, there is good reason to assume similar problems occur in other Chinese cities. Our research suggests that pursuing an effective multi-stakeholder collaboration in developing local energy projects in China might indeed face serious constraints. To some degree,the studied project might even fail to classify as a true collaboratibe effort, as many actors remained captured in an institutional realm with a high dependency on the powerful grid operator.

A clear suggestion that our data points towards is to further study the position of grid companies in the electricity market. Similarly, allocating sufficient power and autonomy to local governments in the electricity sector to assist in ensuring a more balanced check on the power of grid companies is worth further analytical consideration. Doing so might open the market to other stakeholders to engage and contribute to local electricity projects, which is exactly in line with scholars' arguments that leadership is seen as critical to building stakeholder collaboration (Gunton and Day, 2003). This is because it can help empower and represent weaker stakeholders to reduce power-resource-knowledge imbalance between stakeholders and facilitate collaboration (Jiang and Ritchie, 2017).

Furthermore, our data suggests that an effective management process would also be helpful to achieve a more successful stakeholder collaboration. On the one hand, communication and open information between all stakeholders is crucial in the process of collaboration (Renn, 2015). In our case study, we suggest greater focus on information sharing, communication, learning, and instant feedback across levels of governments (e.g., mismatch in PV construction planning), as well as between governments and end-users (include developers). Doing so can help alleviate conflicts through creating equal dialogues and integrated networks among multiple stakeholder groups. On the other hand, it is also essential to have some administrative incentives to enable and motivate stakeholder cooperation, for example as financial support and political enthusiasm (e.g., Jordan and Lenschow, 2010; Ross and Dovers, 2008). Our findings clearly demonsrated that Guangzhou DRC cannot change national policies or the role of CSG. Therefore, it might help if Guangzhou DRC joins forces with Mingzhu Industrial Park council to develop a local community of practice among developers and rooftop-owners. It can do so by collecting and sharing

information, mediating with the state and the CSG, and providing developers with lists of potential end-users with a good reputation, or even to grant additional incentive policies (e.g., tax benefits, priorities) to end-users to incentivise them to rent their rooftops.

6

Embracing an area-specific approach for Chinese energy transition

6.2 Introduction

The present thesis began by discussing how the growing risks of climate change relate to the increased consumption of fossil fuels in cities worldwide. Energy transition is therefore one of the essential steps for mitigating the global climate crisis, which necessarily has to include urban energy transition strategies. Urban China, by all means, is among the prime arenas where urban energy transition needs to be made manifest, as China is faced with international and domestic pressure to reduce its use of fossil fuels. This has led to a strong ambition by the Chinese central government to shift to a low-carbon society. Such a transition not only demands technical and physical innovation, but also requires changes in the governance of energy transition and the many societal and institutional challenges associated with it (Kucharski and Unesaki, 2018; Milchram et al., 2019).

Hence, energy transition in this study is not only considered as a technical problem, but is also a complicated institutional issue in which a multitude of actors and networks need to engage in profound societal change (e.g., Bekebrede et al., 2018). In addition, the spatial dimension of the energy transition has gradually become evident (Faller, 2016) and is likely to trigger spatial constraints and societal resistance on the one hand, while on the other hand, positive examples already show that some towns and cities in China are indeed benefiting from renewable energy production (Zuidema and de Boer, 2017). Typically, such spatial conditions become manifest in the competition for land use, the integration of renewable technologies in dense urban areas, the creation of local spin-off from energy generation, and the related response by societal and business stakeholders. As such, integration towards the energy transition goal will explicitly depend on the specific societal, economic and spatial characteristics of an area. Only relying on traditional top-down *'government'* controlled approaches to deal with such an interrelated and spatially sensitive issue has proven to be problematic (e.g., Breheny et al., 1985; De Roo, 2003; Van Bueren, 2009). Most of the time, central government is typically unable to comprehend the unique local conditions and circumstances as well as related stakeholder interests (e.g., Zuidema and de Roo, 2015).

In the meantime, a paradigm shift has been taking place in planning and policy sciences away from reliance on a technical rationale towards a more communicative rationale and its associated style of governing, in tandem with a shift '*from government to governance*' (e.g., Bailey, 1993; Innes, 1996; Healey, 1997; Rhodes, 1997; Capano et al., 2015; De Roo, 2003; Frahm and Martin, 2009; Jordan et al., 2005; Levi-Faur, 2012). This shift towards a more decentralised and area-based approach has attracted a lot of attention and been called for in dealing with interrelated policy issues (e.g., energy transition) at the local level (e.g., Bannink and Ossewaarde, 2012; Bardhan, 2002; Shah and Thompson, 2004). Next to a top-down *'government'* style of governing, the spatial opportunities and constraints of energy transition urge for area-based and tailor-made solutions due to their sensitivity to local circumstances

and local and stakeholder interests. Doing so involves a decentralised and area-specific approach and also resonates with changes in planning theory that support integrated, communicative and collaborative planning approaches.

Against this background, this PhD thesis has aimed to analyse how such a shift in governance (i.e., towards area-based approaches) can work out within the Chinese top-down political framework on the issue of urban energy transition. Little investigation into how local spatial conditions shape energy governance in Chinese context has been conducted thus far (e.g., Cai and Aoyama, 2018; Han et al., 2018; Yuan et al., 2012; Zhang, 2010). The overarching objective of this study is therefore to address this research gap by improving our understanding of how local energy governance and its policy outcomes are shaped by the Chinese centralised governance system. Following from the research objective, the main research question of this thesis was formulated: *How is local energy governance in China shaped and developing, given the national policy attempts and strategies in pursuing energy transition? And what are the constraints and opportunities for pursuing area-specific energy governance approaches in Chinese urban areas?*

In order to answer these questions, the thesis has applied two analytical lenses and formulated four sub-questions. The first lens is the interaction between central policy frameworks and local energy governance, focusing on how national energy strategies impact local energy governance. As discussed in Chapters 2 and 3, this thesis first studied the function of the Chinese top-down policy framework for energy production and efficiency under different local circumstances (Chapter 2). Thereafter, the thesis explored whether Chinese local authorities have the willingness and capacity to implement decentralised energy policies (Chapter 3). The second lens considered integrated and collaborative working strategies at the local scale, with emphasis placed on a cross-sectoral approach within governments and collaboration between governments and other societal stakeholders. As such, this study investigated how spatially-relevant integrated energy policies are made manifest in urban China with particular attention given to government sectors (Chapter 4). It then also examined how local collaborative energy practices (between government and non-government actors) are shaped by existing institutional rules and regulations defined in Chinese energy governance (Chapter 5).

This study has adhered to a qualitative research strategy. Four main observations are noteworthy from our selected case studies and are explained in detail in Section 6.2. Section 6.3 provides implications for Chinese energy governance while focusing on area-specific policy. The theoretical and methodological reflections of this study are presented in Section 6.4. Finally, Section 6.5 provides an outlook and recommendations for future research.

6.2 Local energy governance in China under national policy attempts

The present PhD research demonstrates that China has clearly embraced the need to pursue energy transition. Therefore, this work has also explored the opportunities and challenges in governing the difficult pursuit of creating integral and situation specific energy transition strategies at the local scale. In this section we discuss the opportunities and challenges of Chinese energy governance in urban areas, and in doing so respond to the four sub-research questions defined in Chapter 1.

Does top-down policy strategy work well in Chinese energy governance...

China has traditionally relied heavily on a centralised and top-down system of policy making and implementation. The essential features of such a top-down approach to implementation is the carrying out of an authoritative decision by lower levels of authorities with clear and consistent objectives (Sabatier and Mazmanian, 1980). Implementation is subsequently based on hierarchical control, with each underlying link receiving orders from the level above it. Authorities in each level are allocated with clear responsibilities and tasks. Therefore, in Chinese energy governance, such a top-down approach is indeed the dominant style of governing. Chapter 2 has analysed a variety of national strategies with which the Chinese central government hopes to achieve its energy goals. Ambitions and targets set by the Chinese central government are expected to be implemented via central control of subsequent policy development and delivery by regional and local governments. Although the strongly hierarchical Chinese administrative system leaves room for lower levels of government to develop regionally and locally suitable strategies for achieving targets, such room is typically limited. In addition, conformance to national targets by local governments remains an important benchmark in Chinese energy governance when evaluated (i.e., the final evaluation of policy implementation usually depends on whether required targets are achieved) to ensure the prescribed policy goals are met. As a consequence, Chinese energy governance does not allow for much bottom-up development of locally inspired policy strategies.

Top-down approaches can create powerful incentives and sanctions to help ensure public policy produces the desired effects, or at least complies with the request for generic, national action. Such a one-size-fits-all policy design, therefore, has been and is attractive when local units can be expected to perform well, and if specific local circumstances are not considered as relevant to the shaping of local policy objectives and targets. As De Roo (2003) argues, a top-down and conformance-oriented policy strategy works especially well for policy issues with relatively simple and direct cause-and-effect relationships and little societal debate

and policy conflict. Meanwhile, the international literature has explicitly demonstrated the limits of relying only or largely on a top-down mode of governance (e.g., Sabatier, 1986; Arceo et al., 2013; Logan, 2018). The present PhD thesis has also demonstrated that the institutional design of top-down approaches encounters large challenges when dealing with interrelated policy issues (e.g., energy and environmental issues), which often have time and place-specific manifestations; i.e., where participating actors, problems, interests, and potential solutions differ according to unique local circumstances.

This study has shown that top-down target setting in Chinese national energy governance can easily risk being insensitive to various local contexts. Notably, it is difficult for central government to acquire the available knowledge of local differences to set the 'right' targets for every context. Failing to take varying local circumstances into account in national regulations, as this thesis has outlined, can be among the causes of lower levels of policy performance at the local level.

Chapter 2 provides key examples where the top-down policy framework for national energy production and efficiency in China has overlooked the hardships and struggles of specific regions and cities that are trying to meet the allocated targets. For instance, the economically weaker cities of Lanzhou and Hohhot felt they were being confronted with unrealistic demands to not only combine targets for economic growth with energy transition objectives, but also to conform to similar targets as the economically stronger cities of Chengdu and Yangzhou. The targets set for Lanzhou and Hohhot thus posed greater conflict with alternative policy priorities that local authorities also had to meet, notably GDP growth and employment. This conflict eventually led to last-minute improvised practices during official state-induced inspections in these cities, arguably resulting in more optimistic evaluation outcomes than would be warranted based on actual local performance. Alternatively, the relatively generic target setting approach was also ill-adapted to provide sufficient incentives in the more advanced cities; for example, in Yangzhou and Chengdu the incentives hardly pushed them further than what already was occurring.

Another key finding of this thesis is that, even when relying on a top-down policy setting, the different ways of evaluating policy implementation can potentially make a big difference. Conformance-oriented policy evaluation, as our cases illustrate, can provoke a 'ticking-of-the-boxes' instead of really promoting actual performance. In other words, sticking to the numbers itself has shown to be more important than real investments, spatial impacts and projects, since the numbers have the final say. Chapter 2 has clearly demonstrated that local authorities have resorted to extreme and unreasonable measures merely to show their compliance with the given energy targets. Their coping mechanisms include, for example, last-minute practices just before or during official inspections, 'creative' data handling, downplaying failures, exaggeration of achievements, and 'prettification' of single actions and measures. Apart from failing to capture the 'bad' performance, this conformance-based evaluation system also risks not capturing 'good' performance, as the Yangzhou case showed. That is, if targets were not reached, performance was considered problematic, even

if the cities made significant and serious improvements. The analysis in Chapter 2 indicates that meeting a target on paper cannot be safely assumed to contribute to improving energy efficiency or energy transition. In other words, a strong conformance-based governance approach might tell a superficial story and could fail to capture the actual levels of policy performance. Alternatively, if policy evaluation is also embracing a more performance-based approach (i.e., judgement based on real actions), local action and ambitions considering local specific circumstances can be actively stimulated because it is *actual* progress that is evaluated; the implication here is that policy implementation could well be enriched.

This thesis does not suggest that conformance-based targets do not create a strong push for the local governments to implement energy policies. In fact, they clearly do. What the cases studied in Chapter 2 illustrate is the importance of seeking a balanced relationship between conformance and performance-oriented strategies and evaluation mechanisms. That is, the combination of top-down pressure and expectations with promoting area-specific policy practices and actions aimed at promoting local projects and actions that are in line with top-down policy ambitions, seems to increase the likelihood of local decision-makers to advance local energy transition. The findings of the PhD thesis indicate that national decision-making should then also consider greater flexibility and adaptiveness in both target setting and evaluation so as to better allow and push for area-specific practices. Such flexibility requires taking local contexts into account and encouraging and motivating local authorities to act and develop policies according to their own local conditions; the implication here is that a more decentralised and area-specific approach is relevant and could add value. Signified by the NEDC and LCC projects, the Chinese state government has also considered this argument and has begun to seek increased local action in purusing its energy transition. In other words, the first signs of creating decentralised working in the pursuit of urban energy transition are visible.

... However, does decentralisation in China allow for area-specific urban energy policies?

Decentralisation has indeed been considered and supported as a complementary approach (compared to top-down) in Chinese energy governance. In the international literature decentralisation is linked to several potential benefits (e.g., Bardhan and Mookherjee, 2006; De Vries, 2000; Zuidema, 2017). Among the potential benefits are boosting the ability of local authorities to respond to complex, interrelated and spatially-embedded policy issues by adapting national ambitions to local circumstances. The main arguments in support of decentralisation are that it can increase government responsiveness and effectiveness to local needs and problems, thus producing more balanced, inclusive and tailor-made policy solutions, thanks to greater knowledge and understanding of local specific circumstances (e.g., Faguet, 2014, 2012; Rumbach, 2016). In this context, local authorities are better placed to balance various local policy priorities, interests, power relations, and resources among local stakeholders, market parties and social organisations. However, other authors have warned that decentralisation also comes with risks and may have potentially

negative consequences. For example, Smoke (2015) argues that decentralisation can be risky since local authorities might not have the capacity and incentives to take action as either the theory predicts or the national government considers necessary. Zuidema (2017) also warns that the outcomes of decentralisation depend on local performance, which is related to local willingness and ability to perform the decentralised tasks and responsibilities. As such, local willingness and ability are regarded as essential factors affecting local performance. Hence, when analysing attempts to decentralise energy policies in China, this thesis has explicitly considered local willingness and ability to perform decentralised tasks, and examined how top-down incentives might influence them.

In studying the local responses to national attempts at creating more scope for (decentralised) local action in developing and implementing energy policies, this thesis began with the assumption that local willingness and ability to develop and implement local energy strategies can not simply be assumed to exist. After all, China has a tradition of relying on a centralised, top-down approach based on regulatory instruments to govern many policy issues. Decentralisation might therefore pose serious difficulties for Chinese local authorities who are not accustomed to creating and developing energy policies by themselves. The focus of this thesis has addressed local decision makers' willingness and ability, and potentials and pitfalls of decentralised (as well as area-based) approaches to energy transition pursued in the Chinese national pilot project: New Energy Demonstration City (NEDC). The NEDC project is one of the core projects representing an institutional attempt to experiment with increased decentralised practices in Chinese energy governance. In this project, local authorities can make decisions independently from national targets and take responsibility for NEDC project implementation.

This thesis finds that local willingness is not self-evident in urban China with regard to development and implementation of locally-based energy transition policies on renewable energy and energy efficiency. Moreover, the present study has found that renewable energy often has a long payback period and unstable earnings, and that governing energy transition is a long-term pursuit that can conflict with short-term priorities, notably GDP growth. These characteristics of renewable energy create what can be described as a weak profile, i.e, the benefits of renewable energy are partly invisible and less tangible (e.g., relative to improvement of global climate change and lower air pollution). Such a weak profile of renewable energy ambitions easily undermines the intrinsic motivations (willingness) of Chinese local authorities as we witnessed in case studies of larger cities of Nanjing and Xi'an (Chapter 3). Chapter 3 clearly illustrated that, despite the rapid increase in popularity, renewable energy has not yet shown itself to be a mainstream policy priority at the local scale in China. The idea of renewable energy, as this thesis stresses, has also had difficulty capturing strong attention and support from local authorities, except in the case of Dunhuang. The lack of intrinsic motivation was even more significant in the cases studied where no external incentives and benefits were provided (e.g., national financial support). As Chapter 3 showed, only limited national support schemes existed, but no external stimuli were available to inspire local willingness, e.g., financial resources, awards and political

pressure. Even cases showing a high degree of local willingness, such as Dunhuang and Yangzhou, argued how limited external incentives and support would lower their willingness to really act, thereby increasing the risk of implementation deficiencies. As a consequence, the examined cases have shed light on the problem that, for some local authorities, the NEDC project runs the risk of resulting in mere campaign slogans and rhetoric without substance.

Local performance in the NEDC project was also observed to be strongly constrained by inadequate local resources and abilities. Limited technical and managerial expertise (i.e., not enough staff, resources and expertise) can seriously undermine the cases studied in Chapter 3. Managerial expertise is paramount in linking area-based approaches that lead to integrated actions and the involvement of various policy sectors and interests. Even economically rich cities like Nanjing and Yangzhou did not think themselves fully capable of developing cross-sectoral and integrated approaches for managing energy transition. This problem was more obvious in economically weaker cities such as Dunhuang. Dunhuang's high willingness to push for energy transition could not guarantee that the local NEDC project would really take off. In addition, both local willingness and ability are also influenced by what Zuidema (2017) calls the 'scope of influence'. The scope of influence implies that there are relevant issues regarding energy policies observable at multiple spatial scales. Such a multi-scalar character tends to lead to a limited local scope of influence over these issues, as the decisions of higher-level or adjacent authorities are also relevant for reaching local ambitions. As Chapter 3 has described, all of the case studies faced serious challenges for renewable energy that proved to be beyond their scope of influence, such as how to access the renewable energy grid. According to our findings, grid integration is controlled by the state-owned grid companies in China, so grid access for (local) private companies is limited and subject to state control. Due to restricted grid access, even if cities increase their renewable energy share, they could face curtailment issues and be restricted in their further development; this is most starkly evident in the case of Dunhuang. Clearly, the wider national institutional setting and the limited scope of influence can easily frustrate local willingness and ability to develop local energy transition policies in Chinese urban areas.

The present thesis also confirms that the benefits of a more decentralised governance approach cannot by themselves simply be assumed to push forward energy transition in urban China. Insufficient local willingness and ability can certainly undermine the outcomes of decentralised and area-based approaches in the energy transition. Notably, thesis results suggest the need for a much more nuanced understanding of how central government and top-down policies interact with local bottom-up governance approaches (e.g., Asif et al., 2013; Koontz and Newig, 2014)gaps remain on how CSR can be effectively integrated with existing business processes. One key question remaining is how to design business processes so that they accommodate stakeholder requirements in an integrated manner. The purpose of this paper is to present a framework that can be used to integrate CSR into business processes. The framework highlights the concept of simultaneous 'top-down integration' and 'bottom-up community-related indicators development' approaches to CSR. These two approaches are elaborated with the help of two cases. The top-down approach

focuses on building CSR into existing business initiatives through an integrated management systems (IMS. Hence, this thesis also highlights that integrating more local policy development should not ignore the role of national policies to enable and activate local authorities and stakeholders to pursue energy transition policies. On the one hand, national incentives (e.g., financial resources or political pressure) can create sufficient extrinsic motivations to stimulate local actions in pursuing energy transition. On the other hand, however, some degree of national support can help local authorities (especially smaller cities such as Dunhuang) by offering professional guidance, training and expertise, e.g., ideas and experience, to better deal with new tasks. In addition, the central government can set up effective regulatory frameworks to enable energy reform which local authorities have limited influence to change. One energy reform example could be for the Chinese electricity market to broaden access to the electrical grid.

This thesis confirms that pushing the energy transition forward in urban China is currently largely based on national top-down policies. The constraints and problems associated with such an approach were also clearly exemplified in the cases studied. Nevertheless, China does show ambitions to opt for more decentralised, area-specific and bottom-up energy policies to complement its national policies. While this seems a sensible and highly valuable ambition, this study concludes that the current top-down policy structure of Chinese energy policies makes developing local energy policies both novel and, as our cases suggest, difficult. Mostly there is a risk that local willingness and ability to develop local energy policies is still too limited to expect decentralisation to result in a clear development of local energy policies. Altogether, the analyses have uncovered key limitations in both the strong top-down approach to which China is accustomed, and the highly flexible NEDC approach that relies almost completely on local and bottom-up actions. The two policy strategies have their own benefits and pitfalls and thus there is the necessity for a harmonic balance between strong top-down policy pressure and the types of actions and ambitions that make sense locally under specific circumstances. Such a balance in governance approaches also implies a balanced interrelationship between the state and local level. Specifically, it matters how we view the role of local authorities in the process of policy implementation. To simply view local authorities as the policy implementer for the state falls short of pushing for a meaningful local energy transition, while considering them free to develop their own bottom-up policies is also simplistic. Instead, this thesis suggests we ought to rather see or encourage local governments as proactive stakeholders who are working together with the state and other relevant stakeholders to jointly deal with energy transition. However, doing so requires a fundamental change in culture and attitude regarding policy development, implementation, and interaction between national and local authorities.

How does cross-sectoral manifest and then work in urban China...?

While it is crucial to consider the interrelationship between central and local governments in understanding local energy governance in China, this thesis also considers local cross-sectoral and collaborative working within the domain of local

authorities as a key analytical theme. After all, energy transition is a complex cross-cutting process and involves a variety of government sectors, including housing, transport and industry. Policies and actions must therefore go beyond what the energy policy sector can deliver by itself; i.e., cross-sectoral working is needed. By looking closely at the role of local authorities, it then becomes necessary to include energy ambitions in other sectoral policies as well and, ideally, to promote a more coherent, cross-sectoral or even integrated policy approach to energy transition. Within the more integrated and cross-sectoral approach, energy issues are discussed and governed by multiple policy sectors that collectively take responsibility and allocate resources to achieve energy ambitions assigned to one particular spatial area (Rode, 2019). A major pitfall to such an approach is that, if the local government is largely viewed as a policy implementer of top-down issued targets, then each local governmental sector has to concentrate narrowly on its own sectoral interests as reflected in targets required by central government sectors. This might easily result in an inward-looking approach and reluctance to contribute to targets and ambitions that other policy sectors face. Chapter 2 of the thesis has shown that China continues to follow top-down decision-making approaches with nationally imposed command-and-control instruments within distinct governmental sectors. In other words, authorities at lower levels of decision-making still have to implement and conform to the targets and tasks allocated by the Chinese central government. Hence, there is real concern because Chinese local authorities encounter difficulties when they try to follow a more integrated and cross-sectoral policy approach within the existing centralised energy system.

Chapter 4 validates these concerns. Both the cases of Chengdu and Yangzhou, as discussed in Chapter 4, clearly demonstrated that policy integration on energy issues at the local level is not self-evident. Although Chapter 4 also showed that energy ambitions are related to or integrated with non-energy sectors at a national and local level, there are no actual local attempts to create cross-sectoral policies. Instead, integration relies heavily on national incentives embedded in distinct policy sectors, that is, the state uses existing sectoral policies to issue energy targets that local governments have to work with. Policy integration with this approach is typically not due to collaboration across local sectors, but rather integration is pursued based on the implementation of national targets in distinct sectors or departments.

National attempts to ensure that energy targets are part of the actions of local *non-energy*-related policy sectors – as the studied cases show – have the potential to support local policy integration. Nevertheless, this potential seems limited. Instead, feelings of ownership and a sense of responsibility for energy transition hardly transcended the confines of the distinct departments to sub-departments responsible for energy. That is, the national projects studied (e.g., LCC and NEDC projects) in Chapter 4 were not seen as being the joint responsibility for all relevant sectors in both Chengdu and Yangzhou. Instead, they were framed as isolated or stand-alone projects within energy departments that were solely responsible for their own policy implementation.

The main reason for this, as found in both cases, was that non-energy sectors have to conform to national targets by implementing sectoral policies regardless of whether or not they relate to energy. They therefore hardly recognise the added value in also pursuing integrated energy policies. Complying with central government targets on energy was already seen by most departments or sectors at local scale as their contribution to the project implementation, but the strict top-down implementation system prevented an institutional culture of cooperation at the local scale in both cases, while experience in, and incentives for, cross-sectoral communication and interdisciplinary project groups were also non-existent. The local government departments and actors interviewed remained detached from policy-making in the implementation of national LCC and NEDC projects. Despite the fact that these projects were considered essential by most, a systematic, holistic and cross-departmental plan based on mutual understanding of each other's responsibilities and interests was missing in both cases studied in Chapter 4.

As described in Chapter 4, top-down implementation and national sectoral incentives might result in reinforcing the departmental tendency to focus on its own sectoral policy agenda, and even create barriers against cross-sectoral working. However, Chapter 4 also found that national policies can still play a major role in promoting policy integration in the local context. For one, as Chapter 3 has suggested, central government can support local authorities by removing institutional barriers, in particular conflicting and fragmented departmental requirements. Moreover, top-down incentives and support, for example, with financial resources and expertise on energy transition is also conditional on the improvement of cross-sectoral and integrated working at local level. These incentives and support can help local authorities acquire the competences and intuitional frameworks that allow for cross-sectoral working on energy transition. Yet again, allowing for more local responsibility in conjunction with national support and incentives to enable and motivate local integrated working has been a key finding of the present thesis.

Given that two developed cities have been studied, it is quite plausible that the problems noted here also exist elsewhere in China. At the least, it is possible to conclude that an integrated working strategy at local scale is not self-evident, and China's top-down political system creates the difficulties for purusing integrated working at local level. Therefore, this study also suggests that the local authority cannot simply be regarded as a policy implementer for the state, especially when dealing with more complex policy issues such as energy transition which, by its function, requires cross-sectoral working.

How are local collaborative energy practices shaped by existing institutional rules in China?

Collaborative working needs to take place not only within governmental organisations. Pursuing energy transition also requires a great deal of societal involvement and implies collaboration between governments and non-governmental stakeholders. Pursuing collaborative efforts demands an effective, flexible and open institutional

framework that is transparent to everyone outside the government domain so as to support and trigger stakeholders to act together on government targets in support of energy transition. As Sovacool (2014) states, institutions structure social interactions and shape individual behaviours that either hinder or facilitate decision-making processes in multi-stakeholder settings. Collaborative energy practices, as much as any form of collaborative practices, are shaped by existing institutional rules and regulations. Both formal and informal institutions can enable and stimulate or alternatively, constrain and undermine collaborative working. Keeping the distinct top-down institutional framework of China in mind, there is broad scope to doubt whether collaborative working can be pursued easily, and if and how existing administrative routines and cultures already influence such working.

Chapter 5 analysed local collaborative energy practices in China using an enriched version of the IAD framework, which was originally proposed by Ostrom. Chapter 5 has shown how stakeholder behaviour and action outcomes on Chinese collaborative energy practices are shaped and defined by formal institutions (through the 'rules of the game') and how contextual practices, informal routines and interactions shape actors' behaviours and actions (i.e., the 'play of the game'). Chapter 5 specifically examined the decentralised photovoltaic (PV) power generation project in Guangzhou, which is not just an example of the struggle, but also of the innovation present in the pursuit of collaborative practices in a large and frontrunner city in energy transition in China. The core research interest was to assess how collaborative working is perceived and how it has evolved, while addressing the perspectives of the government and other stakeholders.

The enriched version of the IAD framework used in Chapter 5 has proven useful. It captured essential contextual influences, the 'play of the game,' and informal interactions regarding local collaborative energy practices. Informal routines and interactions are deeply embedded in existing social customs, traditions, culture, and power dynamics. Chapter 5 demonstrated that, in order to get a timely grid-connection, energy developers often make use of *guanxi* with grid operators to 'get things done.' *Guanxi* is an important informal practice and cultural tradition in Chinese society of personal relationships. Cai et al. (2017) also confirmed that, in Chinese business, the successful formation and implementation of interfirm strategic alliances are highly dependent on whether there is personal *guanxi* across business boundaries, e.g., where *guanxi*, is manifest in information sharing and subsidies allocation. As Chapter 5 found, each year planned grid-connection capacity is made available, and is mainly decided by the NEB (National Energy Bureau) and grid operators. However, the information on how much annual capacity has been used and how much is still available is neither routinely updated nor shared with the public. Investors will then try to obtain this information through personal relationships (e.g., *guanxi*) before making investment decisions. The use of *guanxi* leads to unfair market competition and unfavourable outcomes such as rent-seeking. Moreover, information regarding how and which projects could get national subsidies is also not explicitly shared with the public. Likewise, investors have to get this qualification through *guanxi,* which can cause corruption and manipulation problems. Indeed, this poor transparency of information-sharing among stakeholders has

largely constrained collaborative practices in the implementation of our case study project researched in Chapter 5.

The Guangzhou case in Chapter 5 clearly shows that collaboration is indeed not the immediate and natural way in which the government approaches and interacts with other, non-government stakeholders. Several institutional constraints as well as opportunities have been discovered in the case study project when pursuing collaborative efforts. As found in Chapter 5, the main reason for the institutional barriers to collaborative practices is because state-owned grid operators (CSG and SGCC) in China hold the absolute monopoly position in the development of renewable energy projects. If one single stakeholder has excessive power and resources, it is nearly impossible for other stakeholders to truly collaborate and negotiate. In China, the two national grid companies control electricity transmission, distribution, and retailing. Only electricity generation is open to the private sector, while surplus electricity produced from renewables is not allowed to be sold directly on the market to potential consumers, but instead has to be sold to the two grid operators. Furthermore, these two large monopolistic grid operators can eventually decide when to connect renewable electricity to the grid and for whom. Therefore, as Chapter 5 has described, frequent delays of grid-connection (sometimes taking one year to realise; whereas the regulation stipulates that the connection has to take place within 38-58 business days) has largely influenced the profitability of an energy developer. Such an imbalance of power between stakeholders has potentially far-reaching implications. For example, it can also hinder possible reform and innovation. As the case illustrated in Chapter 5, little progress has been made in changing practices, even though the Guangzhou municipality has been actively pushing for local electricity system reform. Today, the two grid operators are still reluctant to enforce radical structural change in the electricity sector, so the retailing segment has not yet been opened to the market. Consequently, the direct trading of surplus renewable electricity between generators and end-users is still not realised.

While based on only one case (Guangzhou), Chapter 5 confirms our expectations on the problems for establishing a collaborative working style among stakeholders in the Chinese institutional context. Collaborative practices, as our case suggests, are strongly hindered by the dominance of national governments and large monopolistic state companies. Collaboration is meant to be based on open discussion, equality-based dialogue, and decision-making among stakeholders (e.g., Doberstein, 2016; Newig et al., 2018). It demands an open, flexible organisational structure instead of an administratively hierarchical one. Such an open structure allows for the free sharing of information, responsibilities and decision-making, eventually developing a common understanding of policy ambitions. Therefore, this thesis advocates for research to further engage with the position of grid operators who have the most power in enabling a collaborative energy arrangement in China and points at the reconsideration of this position.Such a reconsideration is an urgent task, especially for central government, since it is the only actor able to dismantle this monopolistic position. This finding is in line with other research, especially Vangen et al. (2015), that effective collaboration relies on specific actors who have enough power, resources and knowledge to

direct, influence and enact the collaboration agenda. In addition, it is also highly necessary to give sufficient power and autonomy to local governments in the electricity sector because it can act as a check on the power of the grid companies.

6.3 Implications for Chinese energy governance

The overarching research objective of this study has been to advance the understanding of how local energy governance and its policy outcomes are shaped by, and developed within, the Chinese centralised governance system. After having answered each research question individually, the following subsections addressed two main implications based on the study findings. These implications may contribute to both theory and practice as they illustrate how institutional design at the local level and an area-based approach are essential to the governance of energy transition in urban China.

The importance of involving area-specific approaches in Chinese energy governance

Renewable energy has a substantially larger spatial claim and impact than traditional fossil-fuel energy. Therefore, a major planning challenge with regard to energy transition is the need for careful integration of a vast amount of renewable energy infrastructures and their land use within the urban landscape (Pasqualetti and Stremke, 2018). As a result, the pursuit of spatial integration of renewable energy sources also requires a certain degree of local autonomy and responsibility. The findings of this research suggest that energy transition policies in the Chinese context have scarcely considered local characteristics. As emphasised, the Chinese central government sets the main targets, and local authorities must adopt and, as far as they are able, adapt these policies within their jurisdictions. As this research has showed, the scope for local authorities to create locally distinct energy policy is limited. The reported consequences not only pose difficulties implementing national objectives, but also act as barriers to policy integration and stakeholder collaboration on energy issues at local scale (Chapters 4 and 5).

This study therefore calls for an increase in area-based policy approaches within and complementary to Chinese centralised energy governance. An area-based approach draws attention to specific local conditions and allows local authorities to translate the interrelated policy ambitions and interests into situations or policies that are adapted to (and carry meaning in) their own local contexts. Area-based approaches support local policymakers and planners in their pursuit of integrated and tailor-made energy policies, measures and regulations, such as adaptations to urban low-carbon visions and plans, community management, and developing renewables-based residential districts. Area-based approaches depend on allocating sufficient power and autonomy to local authorities, while

also creating adequate incentives and support for them to capitalise on their autonomy. As such, local authorities are not just allowed, but they are also motivated to pursue innovation and reform on energy issues. Examples vary, but may include renewable energy project development, (partly) opening up the electricity market to local developers, sustainable mobility schemes, and (re)designing urban districts. While promoting an increase in area-based approaches, this thesis has explicitly highlighted the complementarity between decentralised, area-based decision-making and top-down political incentives and support. To achieve a balance, important policy recommendations for policymakers and practitioners at national and local level include the following.

- *Flexibility needs to be considered in national target-setting and policy evaluation at the national level*

National energy policies and plans should allow and promote each area (region and locality) to meet its potential. Incentives should consider different potentials, capacities and constraints. To begin with, such considerations might result in differentiated national (strategic) policies in order to adjust policies and ambitions to local circumstances, which essentially would be an expansion of national target setting on Chinese energy efficiency (Chapter 2). Such differentiation involves creating just enough pressure to trigger local innovation and action. Linked to this, policy evaluation also needs to value the real performance of the implemented policy rather than focusing only on conformance-oriented implementation. Doing so can indeed encourage and stimulate local authorities to genuinely act and produce locally feasible policy outcomes. Meanwhile, local innovation towards energy transition could also be stimulated. In addition, performance evaluations may also help prevent the misuse of data at local level.

- *National support and stimuli should be in place to enable and motivate local action*

Allowing each area to meet its potential also implies the need for national support and incentives to enable and activate local authorities and stakeholders in their pursuit of energy transition policies. The valuable role of national support and incentives should be called forth when implementing Chinese energy policies; these incentives can be generated as three different types: funding (financial support/reward), expert guidance (training), and leadership (power or pressure).

In Chapter 3 we observed how the lack of external financial resources (i.e., financial support/reward) has led to the reluctance of local authorities to implement the decentralised energy policies at local level. Chapter 3 showed how local performance is constrained by the absence of adequate local resources and capacities to deal with the new tasks for energy transition. Therefore, offering local authorities ideas, expertise, and experience becomes very helpful to enable local action to cope with energy issues. Lastly, national incentives also imply that for the central government to use its political power (leadership) creates the 'pressure' to push and promote local performance. Additionally, such political leadership can

remove institutional barriers in the energy sector in order to pursue more deeply integrated and collaborative energy policies at local level (Chapters 4 and 5).

- *Local strategic vision and leadership*

As has been suggested, a more inclusive approach that balances local possibilities and constraints for Chinese energy governance seems to have several policy implications at national level. Furthermore, local input and effort is also needed to create arrangements leading to effective local solutions and governance on urban energy transition. Specifically, this local input demands a contextual strategic vision and leadership that helps local authorities facilitate cross-sectoral communication and working. Based on the cases in Chapter 4, this thesis has confirmed that local political leadership can certainly be instrumental in creating a useful network of collaboration in support of tailor-made energy policies that range across sectoral boundaries at the local scale. This study found that when the Chengdu authority started to create the environment for a more holistic and integrated approach for energy issues, its power and leadership pushed the various sectors to at least discuss and acknowledge their responsibilities in the city in order to reach an integrated energy vison. Hence, this thesis suggests that if Chinese energy governance at local level is to advance, local political leadership/power and incentives should also be valued together with national top-down support to both enable and motivate locally-integrated and area-based working.

Formal and informal institutions both matter

This thesis explicitly has verified that energy transition is more than a mere quest for technological development, or the roll-out of technologies. It is just as much, and possibly more, an institutional quest shaped by many political, social, and economic dimensions involved in the energy transition. Advancing local energy transitions in urban China will benefit from institutional changes that increase incentives for local action as well as the willingness and ability among local actors to work together beyond their immediate responsibilities. While this study highlighted that institutional changes involve different levels of government, it also gave credence to formal institutions (policies, regulations, incentives) in addition to a range of traditions, norms and beliefs, or, in other words, informal institutions. Many of the characteristics of these institutions are deeply embedded in Chinese society; they have played a major role in determining the long-term economic and political development of Chinese society. As such, institutional change is not a simple improvement, alteration or redesign of formal regulations. It is also a change within people.

The longevity of China's imperial history has profoundly impacted on ideology geared towards building and sustaining a highly hierarchical society (Pye, 1992). Even today, the Chinese government under the rule of the Communist Party remains highly centralised, and government and society continue to be strongly hierarchical. The implications of the general features of China's culture on the governance of the energy sector and on individual

behaviour is far-reaching. As observed in Chapter 4, even when policy integration on energy issues is highly encouraged by Chinese central government, local governmental sectors still follow the established pattern of top-down policy implementation and tend to concentrate narrowly on their sectoral interests and on achieving targets required by central government. Moreover, this thesis has also shown how Chinese informal routines (i.e., *guanxi*) shape local energy practices, at least in the case studied, which constrains local area specific policy in support of the energy transition. Given the important role of culturally shaped informal routines, the present thesis has chosen to adopt and enrich the IAD framework in order to conduct an institutional analysis.

In practice, the modified IAD framework showed that the policy-making process regarding grid-connection issues in China is obstructed by deep rivalries between factions based on *guanxi*, behaviour embodied in Confucian tradition. Our Guangzhou case (Chapter 5) clearly revealed that energy developers often use their 'special' *guanxi* with the grid operators to gain business favors for the grid connection. This finding confirms that, even though formal regulations are in place for the grid connection, informal institutions (i.e., *guanxi*) still play a purposeful role by influencing exchanges in the Chinese decision-making processes relative also in the studied case on energy issues. Hence, when pursuing an institutional change in the face of energy transition in a Chinese context, one needs to be aware of and understand cultural influences and historical traditions, particularly when such traditions/norms might lead to negative policy effects such as opportunism and unfairness in the Chinese electricity market (see Chapter 5).

Meanwhile, it is necessary to carefully consider how and what type of policy strategies or instruments in the energy sector may need adjusting for current Chinese energy governance. While not a key objective of this thesis, some initial recommendations can be presented. It is evident that the practice of *guanxi* cannot be ignored when considering Chinese energy governance and notably, the electricity market, particularly in the absence of effective rules of law combined with relatively imbalanced power relations between key stakeholders. In the case of Guanghzou, it would help if local authorities were given more responsibility to challenge (state-owned) grid companies and to advance the creation of transparent systems of information provision and sharing. Other support, such as a further differentiation between regional and local targets, a related process of evaluating performance rather than conformance, and welcoming debate on how localities might choose their own paths under predefined conditions, could lead to a more innovative and proactive thinking in urban energy governance.

6.4 Reflections: contributions and limitations of the research

Two foundational elements used in this thesis are next given critical reflection: the theoretical frameworks and the methodology, which have led to contributions and limitations.

Theoretical reflections

The first contribution of the present study has been the enrichment of the IAD framework for analysing institutions (Chapter 5). In line with other scholars' arguments (e.g., Clement, 2010; Whaley and Weatherhead, 2014), the IAD framework originally developed by Ostrom (2011) is considered both ahistorical and apolitical, and risks over-simplification of the complexity of human relationships. The IAD framework presents institutions largely as given, or formal entities (i.e., regulations, laws, constitutions) shaping actors' strategies and behaviours in an action situation. The framework is therefore unable to fully capture contextual variables, including informal routines, cultural traditions, implicit practices, and power dynamics that also influence actors' behaviours and social interactions. As such, this study has clarified that actors' behaviours and outcomes of a certain action situation can be seen as shaped through formal institutions (i.e., rules of the game), as well as through the interactive, informal practices (e.g., what, when, how, and why) based on how rules are applied by actors in real life (i.e., the 'play of the game'). This 'play of the game' is also highly associated with cultural and historical traditions, customs and beliefs deeply embedded in society and organisations (i.e., informal institutions).

The enriched version of the IAD framework in this thesis has considered the role of context, informal routines, and interactions by adding the 'play of the game' in the analysis of institutions. The added value of this enriched version of IAD is the provision of a more comprehensive and deeper understanding of how actors deal with institutional barriers and opportunities. Specifically, with the enriched IAD, this study could examine the reasons for the mismatch within and between the 'rules of the game' and the 'play of the game'. To illustrate, Chapter 5 discussed how the cultural factor *guanxi* plays a purposeful role in manipulating exchanges in the decision-making process of energy issues. The case of Guangzhou showed that getting a timely grid connection sometimes depends on how close the *guanxi* relationship is between developers and the grid operator; and investors often make use of *guanxi* with grid operators to obtain the information about grid connection capacity before making any investment (Chapter 5). Hence, the analytical approach adopted in this thesis contributes to a richer understanding of institutions by shifting focus away from thinking only in terms of policy objectives and formal regulations, and instead, seeking to understand how social interactions are also influenced by cultural, (inter)organisational and political dynamics in specific institutional contexts.

The second analytical contribution of the present thesis is the use of an area-specific perspective for discussing local impacts of national energy transition policies in China. In doing so, the thesis connected to research on energy transition that has begun to consider the interrelationship between energy systems and their spatial-physical and institutional contexts (e.g., De Boer, 2018; Faller, 2016; Kempenaar et al., 2020; Sijmons and Van Dorst, 2012; Zuidema and De Boer, 2017). This study gives credence to the spatial dimension of energy transition and how an area-specific perspective can support local energy transition. Taking an area-specific perspective on energy issues can help identify how spatial contexts and local circumstances can be supportive to energy practices and policy outcomes. Firstly, the area-specific perspective can help understand how national policies impact on local actions and policies related to energy transition. For instance, as Chapters 2 and 3 have shown, an area-based approach interprets the response of local authorities to the Chinese national policy strategies for the energy transition as influenced by local (geographic and socio-economic) conditions. Hence, an area-specific perspective helps to better ascertain which challenges and opportunities local authorities face while implementing national energy policies. Secondly, an area-based perspective can help clarify how the interrelatedness between energy systems and their spatial/institutional contexts in practice has been translated into local policies. Chapters 4 and 5 have demonstrated how interrelatedness is more than just respecting and adapting to the physical environment; it is also about how various governmental and non-governmental actors are engaged in local energy actions, specifically, their work on integrated and collaborative energy policies or practices. Hence, an area-specific perspective sets the stage for showing how integrated energy policies (Chapter 4) and collaborative energy practices (Chapter 5) not only relate to local institutional structures but are also made manifest in, and depend on, a geographical setting.

Methodological reflections

The thesis has applied a qualitative approach to obtain insights into Chinese energy governance at the local scale, paying close attention to how local contexts are shaped by national Chinese energy policies. The method has both strengths and limitations.

The use of a qualitative approach has allowed for the study of the specific institutional and organisational contexts of the urban cases. Taking local context into account has allowed for close scrutiny of the actual formulation and implementation of urban energy policies. So, instead of focusing on generalisations, the study was better able to identify the conditions shaping local energy governance in a specific and local, spatial and institutional environment and to observe the impacts of these conditions. Distinctions between cities will, to a large extent, influence policy strategies and governance responses to energy practices. Thus, choosing multiple cases of Chinese cities with explicitly different urban conditions (e.g., resource distribution, population size, and economic development) has been instrumental in achieving the aims of this study. Furthermore, document analysis proved useful as background knowledge and understanding situations prior to conducting interviews. In-depth interviews have provided the advantage of first-hand insights into the actors'

experiences of policy implementation, their perceptions of the process, and the deeper reasons for the struggles and possible motivations in the process of decision-making on energy transition in urban China. In-depth interviews have also given insights into both the limitations of formal institutional frameworks and also the application of informal routines, behaviours and traditions.

Nevertheless, it is noteworthy that the methodology adopted in this study has several limitations. Firstly, a qualitative research approach focuses on human perceptions and interactions, so it inherently deals with subjective views. As Appendix A shows, the list of interviewees centres on governmental sectors (including national and regional governments), while different perceptions of other actors related to energy governance (especially local residents and businesses) have received less attention. Although these groups of actors have been included in this study, they have gotten less priority; therefore, their standpoints may have been underrepresented. Moreover, the perceptions of interviewees could be easily influenced by their own personal biases and idiosyncrasies and by the conditioning of common institutional mechanisms.

Secondly, there is the possibility that the degree of openness of the interviewees may be limited. Those involved with the Chinese government (both centrally and locally) are generally reluctant to share their experiences with parties outside the relevant policy sector without this having been discussed, commented on and adequately covered within the sector. Most of the participants who are government officials have relatively high titles (at least Deputy Director of a government sector). Choosing officials as our interviewees was based on the notion that they could discuss the issues from a more macro, overall standpoint. Nevertheless, they may not be aware of the detailed, exact problems during the process of implementation of Chinese energy policies.

Thirdly, given the explorative aim and intent for in-depth engagement with local contexts, only a limited number of case studies has been analysed in this thesis. As noted, this has reduced opportunities for generalisation. Although this study has deliberately focused on variation in the case studies with sufficient distribution within China, the author is aware that a variety of specific local conditions in other Chinese cities with regard to energy transition may have been overlooked. This study is primarily exploratory and has aimed to identify the most important bottlenecks at the local urban level of Chinese energy transition. Addressing these bottlenecks is an open invitation for further research.

6.5 Final remarks and suggestions for further research

After a thorough analysis of the governance of the energy transition in urban China, the thesis recommends the adoption of an area-specific and corresponding decentralised approach. Emphasis has been placed on integration of policy and on cooperation between actors and institutions that focus on Chinese decentralised governance of the energy transition. The study showed how an area-based approach helps to identify and boost energy practices by involving local contexts, local actors and local responsibilities. This study found that, although a degree of decentralisation is necessary in order to hand over more autonomy to local governments, decentralisation cannot by itself simply be *assumed* to work. Importantly, there remains a key role for national policies to create central support and incentives at the local scale.

Based on the main findings and general implications of this PhD research, the following conditions appear to be crucial for integrating area-based approaches into Chinese energy governance. Firstly, if the necessary national support and stimuli are missing, a more decentralised and area-based approach to energy transition has a high likelihood of failure. National support (e.g., financial incentives, policy guidance, and expertise) is a very important condition to create sufficient levels of local willingness and ability which can help and motivate local authorities to pursue proactive and integrated energy policies. Therefore, the support and stimulus provided by central policies and regulations is a crucial precondition for decentralisation to yield positive outcomes. In other words, decentralisation (or area-specific solutions) should be pursued with the condition of assessing whether national policies have enabled, stimulated, and supported local performance.

Secondly, central support is not only essential for providing funds or policy guidance, but also for setting up effective regulatory frameworks and pursuing institutional reforms to remove barriers to energy transition. For example, reform and innovation in the Chinese electricity power system is needed. This thesis has demonstrated that the types of struggles local governments face when trying to implement renewable energy policies are often due to institutional constraints in the Chinese electricity sector. Therefore, the central government needs to build up a more effective institutional framework for energy transition in China.

Thirdly, current energy transition policies (e.g., energy efficiency) in China still largely rely on conformance-based targets evaluation which can provoke a 'ticking-of-the-boxes' instead of promoting actual policy performance. If more successful policy outcomes are desired, decision-makers need to embrace more flexibility and adaptiveness in both target setting and evaluation. This alternative way of policy evaluation could focus more on actual levels of policy performance; here, local unique circumstances and hence local municipalities are allowed to develop their own tailor-made and situation dependent strategies to deal with national policies and regulations.

This research has emphasised contextual conditions for the development of local renewable energy; future research could conduct a comparative study on local, area-specific energy governance between China and other countries with different institutional contexts using either a more market-led or public-led orientation. Indeed, a plethora of research on local energy governance is available (e.g., Beermann and Tews, 2017; Kucharski and Unesaki, 2018; Lammers and Hoppe, 2019)however, is challenged by a complex multi-stakeholder configuration, and by 'rules of the game' (institutional conditions, but it has remained outside the scope of this study to conduct cross-examinations or comparative policy analyses. Such comparisons could shed light on what and which contextual conditions hinder and facilitate energy transition, and for which reasons. In doing so, possible opportunities for mutual learning or policy transfer could be identified; these may not only be helpful to China, but may also contribute to the wider understanding of how energy transition might globally be pursued with respect to the role of local governments.

Moreover, this thesis has also discussed the importance of seeking to enhance the balance between top-down and bottom-up approaches in Chinese energy governance. The development of the urban energy transition calls for local responsibility that can create sufficient space and freedom for area-based energy innovations and initiatives; meanwhile, national support and guidance are also needed. In addition, this thesis has provided some first indications and illustrations of what a nuanced and balanced combination between centralised top-down approach and a decentralised bottom-up approach might look like. Nevertheless, these indications and illustrations remain limited in scope and evidence. Further research can unpack how such a balance might look, assess which institutional frameworks and instruments fit in, and examine how alternative institutional designs and policies actually perform across a range of different circumstances as they progress through the various stages of transition/innovation. Existing literature has already indicated that energy governance has evolved into a complex polycentric structure spanning global, to national, and sub-national levels (e.g., Di Gregorio et al., 2019; Marquardt, 2017). International state, national, sub-national and non-state actors are involved in formulating and implementing energy policies and actions. Such a complex governance structure must have multiple levels of governance (e.g., Jörgensen et al., 2015; Kunchornrat and Phdungsilp, 2012; Schreurs, 2010). To contribute to this debate, future research can investigate how cross-level interaction and collective action, with its related challenges and opportunities, could work in the Chinese context. Multi-level governance involves increased power sharing between the state, market and civil society, and influences businesses and their practice of corporate responsibility for society as a whole (Leventon et al., 2015). Future research could contribute to interactive, integrated, and collective forms of energy governance-setting by examining the role of market-based instruments or market reforms. In particular, the analysis of how China's state capitalism shapes and impacts such a process of multi-level governance would certainly yield fruitful insights into China's energy transition.

Lastly, although the central focus of this study was on government behaviour and corresponding institutional design, the research carried out here has shown the importance

of participation by all related stakeholders in the energy transition. A large body of recent literature has considered the role of civil society in the energy transition (Dóci et al., 2015; Dóci and Vasileiadou, 2015; Magnani and Osti, 2016; Middlemiss and Parrish, 2010). According to the literature, two main points of view could be examined in future studies. One perspective would use the concept of social acceptance of renewable energy sources to analyse local potential conflicts and opposition to renewable energy production projects in the Chinese context. The second exploration could be whether and how civil society in China can play its role as a local source of social and organisational innovation in promoting a sustainable energy system. Based on this, future research can also focus on the study of community-based renewable energy, examining how local knowledge, networks and experiments contribute to locally tailor-made energy practices. Such studies could provide useful insights for governments seeking to identify what types of policy support would also help civil initiatives play a role in the development of new, more sustainable energy systems. Notably, and underlying much of the aforementioned studies, is the particular relevance of the role of communism in China, which can be of added value in approaching civil society to work with the authorities towards a sustainable urban environment.

APPENDICES

APPENDIX A

List of interviewees

Chapters 2 and 3

Location	Type of Interviewee	Organisational Affiliation	Date
Chengdu	Government officers (n=5)	Resources Conservation (within Development and Reform Committee)	02-11-2015
		Environmental Protection Bureau	02-11-2015
		Commission of Economy and Informatisation	04-11-2015
		Planning Department	05-11-2015
		Traffic and Transport Committee	05-11-2015
Lanzhou	Government officers (n=6)	Development and Reform Committee	10-11-2015
		Energy Department (within Development and Reform Committee)	10-11-2015
		Environmental Protection Bureau	11-11-2015
		Commission of Economy and Informatisation (n=2)	12-11-2015
		Human Resources and Social Security	13-11-2015
Hohhot	Government officers (n=5)	Development and Reform Committee	18-11-2015
		Environmental Protection Bureau	18-11-2015
		Commission of Economy and Informatisation (n=2)	19-11-2015
		Human Resources and Social Security	23-11-2015
Yangzhou	Government officers (n=10)	Energy Department (within Development and Reform Committee), n=2	02-12-2015
		Environmental Protection Bureau, n=2	03-12-2015
		Traffic and Transport Committee	04-12-2015
		Commission of Housing and Urban-Rural Development	07-12-2015
		Planning Department, n=2	08-12-2015
		Commission of Economy and Informatisation (n=2)	10-12-2015
	Scholars (n=2)	Yangzhou University	10-12-2015

Nanjing	Government officers (n=5)	Provincial Renewable Energy Department, Energy Bureau of Jiangsu Province	14-12-2015
		Municipal Resources and Environmental Protection Department	15-12-2015
		Municipal Energy Department	15-12-2015
		Energy Office, Jinagning District	16-12-2015
		Development and Reform Bureau, Jiangning District	16-12-2015
	Scholars (n=1)	Nanjing Univeristy	17-12-2015
Xi'an	Government officers (n=5)	Energy Department, n=2	21-12-2015
		Environmental Protection Bureau	22-12-2015
		Commission of Economy and Informatisation	23-12-2015
		Planning Department	23-12-2015
Dunhuang	Government officers (n=5)	Municipal Office	07-01-2016
		Energy Department, n=2	08-01-2016
		Commission of Economy and Informatisation	11-01-2016
		Environmental Protection Bureau	11-01-2016
Beijing	Scholars (n=3)	National Renewable Energy Research Institute	14-01-2016
		Chinese Academy of Social Science (Institute of Urban and Environmental Studies)	15-01-2016
	Government officers (n=3)	National Development and Reform Commission	18-01-2016 19-01-2016
	Journalist (n=1)	China Energy News	20-01-2016
	Managers of energy enterprises (n=3)	CGN Energy Service Co., Ltd.	21-01-2016
		Intelligence Power	21-01-2016
		China Suntian Green Energy Co., Ltd.	22-01-2016

Chapter 4

Location	Type of Interviewee	Organisational Affiliation	Date
Chengdu (n=11)	Government officers (n=8)	Development and Reform Committee	18-06-2018
		Resources Conservation (within Development and Reform Committee)	18-06-2018
		Environmental Protection Bureau	19-06-2018
		Commission of Economy and Informatisation (n=2)	20-06-2018
		Planning Department (with Bureau of Natural Resources and Planning)	25-06-2018
		Commission of Housing and Urban-Rural Development	27-06-2018
		Traffic and Transport Committee	27-06-2018
	Scholars (n=3)	Sichuan Academy of Social Sciences	28-06-2018
		Faculty of Architecture and Environment, Sichuan University	29-06-2018
		Energy Strategy and Low-carbon Development Institute	02-07-2018
Yangzhou (n=9)	Government officers (n=7)	Energy Department (within Development and Reform Committee), n=2	09-07-2018
		Energy Saving Office (within Commission of Economy and Informatisation), n=2	10-07-2018
		Traffic and Transport Committee	13-07-2018
		Commission of Housing and Urban-Rural Development	16-07-2018
		Planning Department (with Bureau of Natural Resources and Planning)	20-07-2018
	Scholars (n=2)	Yangzhou University	16-07-2018

Chapter 5

Location	Type of Interviewee	Organisational Affiliation	Date
Guangzhou	Government officers (n=3)	Municipal Energy Department	10-06-2019
		District Development and Reform Committee	10-06-2019
		Mingzhu Industrial Park Management Committee	11-06-2019
	Scholars (n=2)	Sun Yat-sen University	12-06-2019
		Chinese Academy of Social Science	13-06-2019
	Energy company (n=5)	China Southern Power Grid	17-06-2019
		Other Non-state Owned Energy Companies	18-06-2019
	Developer (n=4)	Guangzhou Development Group Incorporated	20-06-2019
		Construction Company and Technical Service Providers	21-06-2019
	End-users (n=2)	Local Companies based in Mingzhu Industrial Park	22-06-2019

APPENDIX B

Interview guidelines

This appendix provides an overview of the interview guidelines used in the case studies in Chapters 2 to 5. In these chapters, experts, project managers and policy officers were interviewed to obtain detailed insights into the cases, the underlying processes, and the implementation of energy policies. For each chapter, the interview guidelines were prepared on the basis of the conceptual model after a literature study was carried out.

Chapter 2

Energy embedded in local plans and policies

1. How are energy issues/priorities/projects introduced in your municipal policies or in your project?
   For example,
   a. National obligations and standards
   b. National political push
   c. Policy visions
   d. Persons (municipal officers)
   e. Legal requirements (environmental standards/procedures)
   f. Distinct local instruments or strategies (see question 2)
   g. Other, which is ……

2. Which concrete instruments/strategies are used in your municipality/in your project?
   For example,
   a. Methods for evaluation of energy aspects in plans/projects (checklists)
   b. Informal consultation sessions
   c. (In)formal routines of communication
   d. Only permits
   e. Other, which is ……

3. To what extent can local authorities pursue area-specific energy policies?
   a. What is it that you have to do?
   b. What is it that you are allowed to decide for yourself ?
   c. What is it that is stipulated but is not obligatory?
   d. What is it you have to do yourself?

   Please explain……

Knowledge of national policies and initiatives

4. Are you aware of the key national energy policies, regulations and projects?
   For example,
   a. 11th FYP Medium and long-term plan for energy conservation
   b. 12th FYP Energy conservation and emissions reduction
   c. Action plan on energy efficiency and low-carbon development

5. Are you aware of the relative division of responsibilities on these policies, regulations and projects between municipality, province and state?

6. How are these policies, regulations and projects translated into local policies?

7. How many energy policies does the municipality develop and prioritise (as compared to national policies and regulations)?

Priority and implementation

8. How much priority do energy issues get in these local policies and within the different local departments (e.g. mobility, housing, economy, environment, etc.)?

9. In your opinion, how strong are energy issues as compared to other interests (e.g. mobility, spatial development, social wellbeing and development, economy, etc.) in your municipality/project? (very strong, strong, moderate, fairly weak, very weak) and why?

10. Which factors are contributing to the success and/or failure to introduce energy into more encompassing urban policies?
    a. What are the main barriers for implementation?
    b. What are the main success factors?
    c. What are the best examples?

Any suggestions for improving renewable energy policy implementation?
On every governmental level

Chapter 3

1. How would you evaluate the current degree of centralisation or decentralisation in Chinese energy policies? Is there a visible shift? If so, can you indicate what you see for the changes (and possibly, what you do not envision)?

2. [only for national experts] Why pursue a degree of decentralisation?
   a. What are the main reasons?
   b. Are the municipalities you work with actively pursuing proactive and integrated approaches to deal with energy transition in their cities? If so, does decentralisation help in this process?
   c. What are the key difficulties they face when coping with more centralised working?

3. When it comes to decentralisation, which type of effort do you recognise that the central government adopts? Consider the following pathways:
   a. Pilot projects or experiments
   b. Full decentralisation (local authorities are granted true autonomy)
   c. Only limited decentralisation (local authorities get a bit of extra autonomy but within central generic guidelines, objectives or visions)
   d. Other, which are/is…….

4. Political willingness: how would you judge past and current willingness in your city/the cities you work with to push for local energy transition policies?
   Please consider (*please illustrate with examples*):
   a. Do politicians share the objectives of the state, and do they share the way of working with the state policies?
   b. Do administrators agree with their own politicians when these politicians agree with the central objectives, and to what degree?

5. Institutional capacity:
   Is your city/are local authorities you work with able to take on already decentralised or possible to decentralise tasks and responsibilities?
   Please consider ability regarding at least the following points;
   please do illustrate with examples.
   a. Technology
   b. Expertise (technical)
   c. Management capacities
   d. Department priorities and tensions or integration between them (cross-sectoral working)
   e. Economic support/ investment
   f. Power
   g. Plans and policy development and implementation
   h. Others, which is/are?

6. For the pilot project of *New Energy Demonstration City*,
   a. What is the political aim: why has your city/the cities you work with applied for it?
   b. How does/do (your) local authority(ies) develop and implement the project?
   c. What do they really get done; does your city really gets it done? Which factors regarding willingness and ability are the main drivers and constraints for doing so? (see questions 4 and 5).

7. How is the current situation regarding the pilot project(s)?
   a. How has it/is it developing and how would you judge the implementation and actual outcome(s)?
   b. Are you/they meeting the central requirements/expectations or not? To what extent? (any minimum requirements?)
   c. What are the main reasons for success or failure (also consider question 6)?
   d. What would you regard as the key difficulties of developing the above pilot projects? (consider both factors related to local working and national policy frameworks and incentives).

8. What conditions might help to increase the performance, both of the national government and local government? (i.e. which changes would you suggest are most crucial to boost performance?)

9. Is there anything that we might have missed, or that you would like to address?

Chapter 4

Inclusion in sectoral plans and policies:

1. Are energy issues or low-carbon development mentioned in your policy domain? In what way?
   a. Sectoral obligations and standards
   b. National political push
   c. Sectoral policy visions/ambitions
   d. Persons (municipal officers/sectoral leader) who work on this
   e. Other, which is ……

2. Has your department taken actions to include energy concerns (or low-carbon development) in the planning/policy making and implementation process? Such as:
   a. Consultations with experts and stakeholders, such as…..
   b. Actively supporting decision-making in favour of energy transition issues, such as ….
   c. Energy-related initiatives/measures are taken into sectoral policies, such as …..
   d. Others, which are/is …..

3. If such actions have been taken, what do they encompass and at what stage in the planning process? Are these measures taken based on win-win conditions?

4. Who leads and is responsible for such integration actions?

5. What do you think of your responsibility?

Consistency

6. Are there relevant binding targets or policies in your department, such as nationally issued targets and requirements that conflict with energy objectives/ambitions/ requirements? Examples?

7. How does your department/organisation deal with potential conflicts of interest with the energy sector? How to reach an agreement in the end? Who is involved?

8. Is there shared understanding of the energy issues among actors and policies among the different sectors/departments? What kind of shared understanding/on what? How much?
   a. Shared awareness that energy is an important issue
   b. Shared vision that something should be done related to energy transition

9. Are there cross-sectoral plans, policies and procedures? If so, which and how cross-sectoral are they? Who leads/owns them? Are there any procedures for policy synergies or alignment?
    a. (In)formal routines of communication among sectors and stakeholders collectively make decisions
    b. Formal checks/consultations
    c. Informal consultation sessions
    d. Rarely have communications among sectors/departments
    e. Only address things from our sectoral/departmental perspective
    f. Others, which is …..

Weighting

10. How much priority do energy issues and ambitions receive when compared to other issues on the agenda (e.g. mobility, spatial development, social wellbeing and development, GDP growth, etc.)? And regarding which other issues, is it relatively stronger or weaker? Are there distinct energy ambitions that seem weaker/stronger?
    a. How much in general (for more strategic policies/stating the ambition)?
    b. How much in the face of other issues when aiming for real implementation (actual choice)?

11. Why does your department consider energy issues or projects as relevant? (other than the formal requirements mentioned in q.1.)?
    a. Political push
    b. Sectoral/departmental vision and policies
    c. Economic interest-driven (profit-oriented)
    d. Others, which is/are …..

Resources

12. Does your department have the knowledge, time, skills, and other rescores (e.g., competent staff) to work on energy issues? Where are you stronger and where weaker? How is it developing?

13. Is internal and external know-how available for dealing with energy issues and projects? Does your sector/department have the capacity to attract needed resources (e.g., skilled staff, funding)? Does it happen and does it help?

Performance

14. What measures have been taken in practice? How are the outcomes? What are the consequences and real impact(s)?
    a. Successful as expected
    b. Failed/largely unsuccessful
    c. In between

    Please reflect and also indicate if there are big differences between various projects/ policies.

15. What are the main reasons for successes and failures?
    a. Consider key barriers for implementation (institutional frameworks, willingness and ability)
    b. Consider key success factors (institutional frameworks, willingness and ability) What are the best examples of success/failure and the factors contributing to them?

16. Are these energy policies evaluated after implementation? Is there any institutional setting/arrangement for the learning process, or feedback given during/after policy implementation? Are these results shared across sectors/departments?

17. What factors, in your view, enable or inhibit the integration of energy transition concerns in your sectoral/departmental policies?

18. List at least 3 barrier factors when it comes to integrating energy/low carbon ambitions in your city's(ies) overall policy development and actual development.

Chapter 5

Actors

1. Who is the initiator, and which actors usually participate in these projects and collaboration(s)? Which actors are not involved but should be?

2. How are these actors involved in these projects/collaboration(s), why and when (how long, how often)?

3. What do actors in certain positions want or need? Why do these actors have these wants or needs? How do the wants and needs of actors relate to each other?

4. How did you get in touch with the projects/collaboration(s)?

5. Why do you participate? (e.g., driven by mandates, economic benefits or the benefits of the collaboration)
   a. What is your vision (goal) regarding these energy projects and the collaborations in general?
   b. What role do you play in deciding on and implementing actual projects (or decision-making process)?
   c. What are you allowed/encouraged to do (or what do you have to do?) and what not?
   d. And why?

Policies and decision-making

6. What does the policy-making and decision-making process look like (describe the procedure)?
   a. How is it decided whether a policy initiative will be started/carried out?
   b. In which way?

7. Who is doing what during the policy-making and decision-making process? Are you clear with other actors' positions, goals and resources, and do you know which strategies they employ to pursue their goals or strengthen their positions?

8. Who has influence over decisions made? Whose opinions are considered as (more or less) valid? How do you feel your position/degree of influence is regarded during policy-making and decision-making? Who leads and/or coordinates and is responsible for policy-making and decision-making? How much room for decision-making is there for you?

9. Which policy framework(s), (i.e. policy/regulations/rules) are influential, created and adopted in instigating and implementing concrete energy projects?
    a. Which policy frameworks have been/are being developed?
    b. What has been decided and what has not been decided?

Collaboration

10. Do you share a common sense of mission, strategy and value with other actors (degree of goal similarity)? If so, in what ways, through what formal or informal institutional channels/structures is (or has) such a mission been created and shared? Are there any external mandates to push for a common mission and the related collaboration? What do you think of such (possible) mandates?

11. How do you experience the (shared) attitude of this collaboration and the concrete projects in it as a whole, and what do you think of other actors' attitudes (passive, active, willing, proactive, visionary, innovative, only only financially-oriented, or more, etc.)?

12. What are conflicts that occur in collaboration, both regarding different stakeholders and their interests, institutional barriers and more informal ways of working or collaborating (what is going well/bad? with whom?) In what ways do you or others (collaboration as a whole) deal with these conflicts?

Information, resources and outcomes

13. What information is shared between which actors, how, why, and when? What information is not available to you? Are you (actively) being prevented from, or accommodated with, to gain access to information?

14. What outcomes are being considered? Which frameworks (external to your collaboration or created in it) influence this? What room is left for actors to deviate from these planned outcomes? To what extent are outcomes delivered and linked to actions?

15. What are the rewards and sanctions related to this collaboration and/or distinct energy projects? How are costs and benefits distributed among actors, and which costs and benefits and distribution of them are/is deemed acceptable (and why?)

Learning and feedback

16. Are you involved in feedback when evaluating information and gained knowledge stemming from projects (and if so, how and with whom?)

17. Is there a monitoring system to evaluate the progress of the project(s)?

Others

18. Could you offer a general comment on the current management/outcome of the energy project(s) and collaboration as a whole?

19. What are the 3 biggest barriers that you experience when developing these energy projects and working in this collaborative setting?

20. What could be improved?

APPENDIX C

List of policy documents

Chapter 2

Issued agency	Document name	Year
NDRC	11th FYP Medium and long-term plan for energy conservation	2004
State Council	The 11th FYP Guideline for China's economic and social development	2006
State Council	Comprehensive work plan for energy conservation and emissions reduction for the 12th FYP period	2011
MOT	12th FYP Road and water transportation conservation plan	2011
State Council	The 12th FYP for National Economic and Social Development of the People' Republic of China	2011
Sichuan General Office	Sichuan 12th Action plan of energy conservation	2011
Lanzhou General Office	Lanzhou 12th FYP of energy conservation	2011
State Council	12th FYP Energy conservation and emissions reduction	2012
MOHURD	12th FYP Building energy conservation plan	2012
Jiangsu General Office	Jiangsu 12th Action plan of energy conservation	2012
State Council	Action plan on energy efficiency and low-carbon development (2014-2015)	2014

Chapter 4

Issued agency	Document name	Year
Chengdu General Office	Notice on the encouragement and regulations of developing time-sharing rentals industry on new energy vehicles	2017
Chengdu Transport Commission	Guidelines on the encourgement and regulations of the development of new energy vehicles timeshare rental industry	2017
Chengdu DRC	Chengdu's 13th Five-Year-Plan on economic and social development	2017
HCDJS	The mission plan of developing building energy efficiency and green building	2018
MOHURD	The 13th Five-Year-Plan of development of building energy efficiency	2017
NDRC	Notification on pilot work of low carbon city and provinces	2010
NDRC	The 13th Five-Year-Plan of energy development	2016
NDRC	Notification on pilot work of the third batch of low-carbon cities	2017
NEB	Notice about applying for New Energy Demonstration Cities and (industrial parks)	2012
NEB	The list of pilot New Energy Demonstration Cities (industrial parks) (first batch)	2014
State Council	The new urbanisation plan (2014-2020)	2014
State Council	Chinese urban adaptation to climate change action plan	2016

Chapter 5

Issued agency	Document name	Year
State Council	Regulations on the PV manufacturing industry	2013
NDRC	Interim measures on distributed generation	2013
NEB	Notice on the interim measures of the decentralised PV power generation projects	2013
NEB	Notice on constructing distributed PV power generation demonstration area	2013
NEB	Comments on the support of distributed PV power generation by financial services	2013
Ministry of Finance	Notice on subsidy policies of distributed PV power generation	2013
CSG	Service guidelines on distributed PV power generation	2013
Guangzhou DRC	Guangzhou's regulations on distributed PV power generation projects	2014
China Energy Research Institute	Study on the policy roadmap of distributed PV power generation in China	2015
Guangzhou DRC	Guangzhou 13th FYP of energy development	2016

APPENDIX D

Results of institutional analysis

Table A.1
Results 'Rules of the game'

Position rules define the positions or roles held by actors		Sources
P1:	*Policy and regulations:* • State Council, NRDC (including NEB) and Guangzhou DRC are the authorities for making strategies, policies and regulations regarding renewable energy, decentralised PV and energy ambitions; • China Southern Power Grid (CSG) also acts as the authority for making regulations regarding grid-connection, engineering design and construction, expense settlement, etc.	*D1, D2, D3, D4, D7, I1, I4, I8, I9*
P2:	*Executive agency:* • Guangzhou DRC (including Conghua District DRC) is responsible for making plans, negotiating with relevant sectors, PV project approvals, tracking project performance, receiving feedback and reporting to NEB; • Mingzhu Industrial Park Council takes charge of encouraging and communicating with enterprises within the industrial park to participate in the project and to rent out their roof resources.	*D9, I1, I2, I3*
P3:	*Developer:* The enterprise with development qualifications is allowed to develop, construct and manage the whole project.	*I4, I5, I6*
P4:	*Local enterprises in Mingzhu industrial park:* These local enterprises are the potential end-users who can rent out their roof resources to developers for PV installations.	*I3, I4, I5*
P5:	*Licensing authorities:* • Guangzhou DEP is the licensing authority for the environmental permit; • Guangzhou DRC is the licensing authority for the permit of project application.	*I1, I3, I5*
P6:	*Subsidy and investment:* • Ministry of Finance provides subsidies to local CSG per quarter, which then monthly provide these subsidies to end-users or developers on behalf of the national government for 20 years; • Guangzhou Financial Department also provides subsidies via CSG; • China Development Bank follows the national strategies and provides loan services to developers.	*D6, I1, I3, I13, I14*
P7:	*Grid operator:* National regulations state that CSG is responsible for realising the grid connection.	*D7, I8, I9*
P8:	*Supervisory authority:* Guangdong province DRC, Guangzhou DRC and South China Energy Regulatory Office are the supervisory authorities for monitoring the situations of grid-connection, electricity cost settlement, and fairness of market competition.	*D1, D3, D4*

Boundary rules define who may enter or leave positions		Sources
B1:	*Location:* Guangdong province and Guangzhou municipality (e.g. DRC) choose Mingzhu industrial park as the project location, and thus this specific area determines which actors are involved (e.g., end-users, owner of PV installations).	*D9, I2*
B2:	*Legal regulations:* Legal regulations determine that CSG takes charge of all the electric power market-related issues for southern China (Guangzhou is included in this region).	*D1, D7*
B3:	*Competition:* Developers enter the arena based on competition on price and a feasible proposal; Guangzhou DRC determines which enterprise will be the developer for the project.	*D9*
B4:	*Project development:* The developer determines additional parties may enter or leave the arena (e.g. construction parties, investors, think tanks).	*I8, I9, I10, I11*
B5:	*Local enterprises with rooftops:* Roof owners decide whether to rent out their rooftops to the developer.	*I15, I16*
B6:	*End-users involvement:* The end-users of this project are only confined to the enterprises in the Mingzhu Industrial Park, while other citizens and enterprises nearby this area cannot get involved to be potential end-users because of the current electricity market system.	*I4, I15, I16*

Choice rules specify what actors in certain positions may, must, or must not do at certain points		Sources
C1:	*Make policies and regulations:* State Council, NEDC, Guangzhou DRC and China Southern Power Grid may draft policy and regulations for their legislative domains (see P1).	*D1, D2, D3, D4, D7, I1, I4, I8, I9*
C2:	*Choose locations:* Guangdong province and Guangzhou municipality (e.g., DRC) may designate locations for the PV pilot project.	*I1, I2, I7*
C3:	*Submit bid:* Every potential developer may submit a bid in the competitive bidding procedure.	*D9*
C4:	*Apply for permits:* The developer must apply to municipal DEP for an environmental permit.	*I4, I5*
C5:	*Contact with construction and investment parties:* The developer may seek and cooperate with construction parties to complete equipment installation, e.g., electric power design, PV installation.	*I4, I6, I7*
C6:	*Sign the contract:* The developer must sign the contract with owners of PV installations to rent their roof resources in the industrial park.	*I15, I16*
C7:	*Arrange grid connection:* The developer must contact CSG to have grid connection. Regulations in D7 (made by the CSG itself) stipulate that the grid operator must provide grid-connection plan design service within 20 business days and must finish the grid connection service within 38-58 business days. The grid operator must provide free-of- charge services on grid connection for decentralised PV electricity.	*D7, I5, I8, I9*

C8:	*Apply for subsidies:* After grid connection, the developer may apply for subsidies from CSG based on electricity production, which monthly provides transfer-payment of national and municipal subsidies.	*I1, I4, I5*
C9:	*Electricity supply:* Article 25 of Chinese Electric Power Law stipulates that there is only one electricity selling agency allowed to be within a certain service area. That means CSG must supply power to the users of Guangzhou, while other possible electricity supply enterprises must *n*ot do any electricity trade with end users.	*D11*
C10:	*Pay electricity bills:* The end-users (i.e., owners of PV installations) must pay the electricity bills to the developer.	*I15, I16*
C11:	*Investment:* Banks, security and insurance companies may support loan or any other financial services.	*D1, D5*

Aggregation rules determine 'who is to decide' which actions or set of activities is to be undertaken.		Sources
A1:	*Permit decision:* The Guangzhou municipality must decide whether to provide environmental and development permit to developers.	*I1, I3, I5*
A2:	*Grid connection:* According to regulations in D7 (made by CSG itself), CSG decides whether and when to connect the PV power generation to the grid.	*D7, I1, I4, I5*
A3:	*Subsidies:* NDRC, NEB, the Ministry of Finance and Guangzhou Financial Department must decide whether and when to appoint subsidies to developers after the PV projects is in operation. According to regulations in D6, these authorities have the decision-making power to change the subsidy policy.	*D6, I4, I5, I14, I16*
A4:	*Business models:* • The developer must choose one of the two business models when applying for the project development; one is to sell all produced electricity to the grid company and the other is to sell surplus electricity to the grid company; • NEB has the right to decide what kinds of business models developers can choose.	*I1, I2, I4*
A5:	*Investment:* Banks and other investment institutions decide whether to give developers loans.	*I13, I16*
A6:	*Roof owners*: Local enterprises with roof resources decide whether to rent out the roof to the developer.	*I15, I16*

Information rules determine what information is to be sent and received by which actors at what moment.		Sources
I1:	*Publishing PV power generation plan*: • NEB must publish annual construction plan (e.g., target of installed capacity) for PV power generation and distribute this plan to provincial and municipal governments; • Municipal government and grid company must regularly publish the information of available grid-connection capacity to the public.	*D10, D11*
I2:	*Consultancy:* The developer may get consultancy services from think tanks regarding technical and financial terms of the project development.	*I4, I5*
I3:	*Regular feedback:* Guangzhou DRC regularly communicates with developers about the progress of the project (e.g., grid-connection, subsidies distribution, challenges) via regular meetings and workshops.	*I4, I5*

Scope rules delimit the potential outcomes of the action situations.		Sources
S1:	*Pioneer zone:* Guangzhou municipality set the target to make northern Guangzhou as the leading area for renewable energy use.	*D8*
S2:	*Electricity market reforms:* NEB plan and Guangzhou 13th FYP encourage reform of the current electric power system, in particular the plans support that decentralised renewable energy be included in the electricity trading market.	*D4, D8*
S3:	*Two business models:* In the beginning, developers can only choose the model "prosumption + surplus electricity sold to grid company;" while afterwards (in the year of 2014), another model is added: all produced electricity can be sold to the grid company.	*I1, I4, I5*
S4:	*Loan support:* NEB and China Development Bank publish financial policies to support loan services for projects of renewable energy use, particularly for decentralised PV power generation pilot project.	*D5*

Payoff rules affect the benefits and costs assigned to actors in light of outcomes.		Sources
Y1:	*Cost and decent profits:* • Developers must pay the rent to the enterprises that rent out their roof resources, and they also must pay the costs for investigation, research, consultancy, and project construction; • Developers earn profits from PV power generation project (including national and municipal subsidies).	*I4, I5, I13, I14*
Y2:	*Save money on electricity bills:* End-users pay lower prices to developers than grid companies.	*I15, I16*
Y3:	*More sustainable city:* Guangzhou municipality may complete its political ambition of stimulating renewables use and also make the city more sustainable.	*I1, I2*

Table A.2
Results 'Play of the game'

Practice related to **position rules**		Sources
Pp1:	*Incentives:* • Simplify process: Guangzhou DRC and other related sectors simplify approval procedures for PV power generation projects, including issuing permits in terms of environment, energy saving, land use, construction, etc.; • Municipal subsidies: Apart from national subsidies, Guangzhou Financial Department also provides subsidies to developers and owners of PV installations. These incentive measures largely motivated developers and owner of roof resources to participate in the PV project.	*I1, I3*
Pp2:	*Concerns between developers and owner of roof resources:* • A large number of enterprises within the industrial park are reluctant to rent out their roofs to developers in consideration of roof security problems (e.g., load bearing, leakage) and issues of rental period, rent and electricity prices. Developers are worried about some enterprises' operating capacity (e.g., risks of bankruptcy and losses) and credibility with regard to whether they can continuously pay electricity bills over 20 years without default (the lease period of decentralised PV project is generally 20 years). All these concerns make it difficult to reach an agreement on the issue of roof rental. • On this issue, Guangzhou DRC and Mingzhu Industrial Park Council did not really participate in the negotiation process coming up with any possible incentives or safeguard actions to motivate both parties.	*I13, I14*
Pp3:	*Reluctance of grid operator:* The grid operator (CSG) was not willing to realise grid connection on decentralised PV power generation, especially in the early stage of the project, and it started to take action afterwards because of political pressure from central government.	*I9, I14*
Pp4:	*Unclear positions of supervisory authorities:* • There is an ambiguous division of responsibilities among supervisory authorities; for example, who exactly is taking charge of what? what should be supervised? • These supervisory authorities also have limited power to truly play the role of check and balance to grid operators' power; • There is no authority specifically taking charge of monitoring the implementation of this pilot PV project; • Currently, all these supervisory authorities are not independent ones; they are subordinate agencies to DRC.	*I5, I6, I10, I11, I13, I14*

Practice related to **boundary rules**		Sources
Pb1:	*To be the developer:* Guangzhou Development Group Corporation (GDGC) was directionally selected by Guangzhou DRC to be the developer for this pilot project without publishing bidding information to the public. This is partly because of *Guanxi* between local government and GDGC and GDGC's own development capacity.	*I4, I5*
Pb2:	*Referee & competitor:* China Southern Power Grid has the monopoly position on transmission, purchase and sale of electricity in southern China, which plays the role as a referee to decide issues related to electricity grid (e.g., grid connection, construction). However, it can also be as a developer participating in the competition with other potential developers and can squeeze other competitors out of the competition relatively easily.	*I5, I10*

Practice related to **choice rules**		Sources
Pc1:	*Acquire the development right:* Guangzhou DRC did not publish bidding information to the public; instead, it specifically chose GDGC as the developer taking responsibility for the project's development. GDDC is a state-owned energy enterprise with a strong investment and development capacity and it also has a close *Guanxi* (relation) with the local government.	*I3, I4, I5*
Pc2:	*Political targets:* The developer participates and invests in the PV project for two main reasons: • Each year state-owned power generation enterprises must develop a certain percentage of renewables-based projects. This is a mandatory target; • Guangzhou DRC has a rigorous permit procedure to approve fossil fuel projects, which also pushes enterprises to invest in renewables projects as a new profit.	*I4, I5*
Pc3:	*Put off the payment of national subsidies:* National subsidies often cannot be paid on time, in general, its payment has been delayed for more than one year.	*I6, I13, I14*
Pc4:	*National subsidies constantly decrease:* The central government at constantly unexpected times decreased the subsidies to decentralised PV projects in recent years in order to make the PV industry more market-oriented.	*I4, I5*
Pc5:	*Put off grid connection:* CSG has the dominant power in the decision of grid connection, and it often happens that grid connection cannot be realised within the prescribed period which has been regulated in D7 (see C7). The working efficiency of grid connection sometimes depends on the *Guanxi* between the grid operator and developers.	*I4, I5, I16*
Pc6:	*Choose not to go to court:* When there are inequities occurring in the electricity market (e.g., put off grid-connection, unfair competition), developers choose not to go to the court because they do not want to spend too much time in court instead of conducting another business. Moreover, developers do not want to undermine the relationship with grid operators, who have the monopoly position in electricity sector.	*I6, I10*

Pc7:	*Put off the payment of electricity bills:* Some enterprises (end-users) cannot pay their electricity bills to developers on time because of their operating capacities.	*I3, I16*
Pc8:	*Investor:* Banks and other financial institutions are not that interested in investing in decentralised PV industry, especially with regard to smaller energy companies.	*I2, I4*

Practice related to **aggregation rules**		Sources
Pa1:	*Monopoly position:* CSG, as one of the two largest state-owned monopolised grid operators in China, controls electricity transmission, distribution and retailing in southern China. It also has ministry-like political status. It acts as infrastructure planners and builders, transmission network operators, regulator through standard-setting, technology developers and energy services providers. This dominance of CSG determines that little decision-making room remains for other relevant stakeholders (e.g. citizens, local governments, developers, etc).	*I2, I3, I4, I5, I15, I16*
Pa2:	*Local and national government:* • If there are some problems regarding local subsidies, project approval, environmental permits, land-use or cross-sectoral disagreements, local government has the autonomy to make decisions based on citizens and developers' feedback; • However, if the problem is fundamental that the entire industry is facing (for example, speeding up the process of grid-connections, allowing for electricity trade, reforming the current electric system), local government only has limited options to make decisions - only the national government has the final say (e.g., State council); • CSG has almost the same political power as NEB.	*I1, I2, I14*
Pa3:	*Subsidy policy:* Governments get the most decision-making power on subsidy policy (e.g., the amount, length of time, to whom, to what project) while developers or citizens are in relatively passive positions and have to follow the change of the policy.	*I5, I10*

Practice related to **information rules**		Sources
Pi1:	*No information sharing platform (grid-connection):* • No information sharing platform for the whole decentralised PV industry; • There is only a certain capacity available each year for grid-connection, but this information is only owned by grid companies and is not shared with the public. Therefore, developers are not sure if the project is worthy to be invested in, and sometimes they have to get this information through personal relationships before any investment takes place.	*I5, I8, I16*

Pi2:	*No information sharing platform (installed capacity):* Each year, NEB has a certain target of planned installed capacity on decentralised PV to be delivered to lower levels of governments, and only the projects within the assigned targets can receive the national subsidies. However, the information about what and how projects can get involved in the target scope is not shared with the public. Therefore, investors might use *Guanxi* to try to get this information.	*I1,I4, I10,I11*
Pi3:	*Instant feedback but no solution to the essential problem:* Guangzhou DRC often has communications (e.g., workshops, meetings) with related stakeholders to get feedback on the project implementation. However, local government has limited power to deal with the essential problem that the whole PV industry is facing, e.g., grid-connection or electric power trade.	*I2, I3*

Practice related to **scope rules**		Sources
Ps1:	*Less return risks:* Since NEB made the decisions that all the produced electricity can be sold to the grid company, decentralised PV projects start running because the earnings can be safeguarded.	*I13*
Ps2:	*Less enthusiasm in investment:* Because of reduced national subsidies, developers have fewer profits from the project investment and thus they have much less enthusiasm about further investment. There is a conflict between governments and developers on decentralised PV industry.	*I5, I14*
Ps3:	*Surplus electricity cannot be traded:* Although Guangzhou municipality has the ambition to reform the current electricity system, only slow progress has been made. Surplus electricity still cannot be traded in the market due to the monopoly position of CSG in China.	*I4, I5, I7*
Ps4:	*Unfriendly financing environment:* There are difficulties for developers to get loan support from financial institutions in investing in decentralised PV projects, in particular for smaller development enterprises.	*I4, I10, I11*
Ps5:	*Uncontrolled installation size:* Although NEB (central government) each year has a guided target for the installation size of decentralised PV, local governments are generally more active in fostering PV construction. This condition has caused excessive installation size than expected. This is a mismatch between central government and local government on installation size of decentralised PV projects.	*I2, I5, I10, I13, I14*

Practice related to **payoff rules**		Sources
Py1:	*Subsidies:* The central government wants to limit the subsidies and decrease the installation size of decentralised PV projects. This shows a conflict of interest between governments and developers. The central government wants the PV industry to be developed in a more market-driven model.	*I4, I5, I6, I7, I13, I14*
Py2:	*Return risks:* The earnings from end-users cannot be fully guaranteed since it depends on the payment and operation ability of local enterprises who rent out their roof resources.	*I3, I4, I13, I14*

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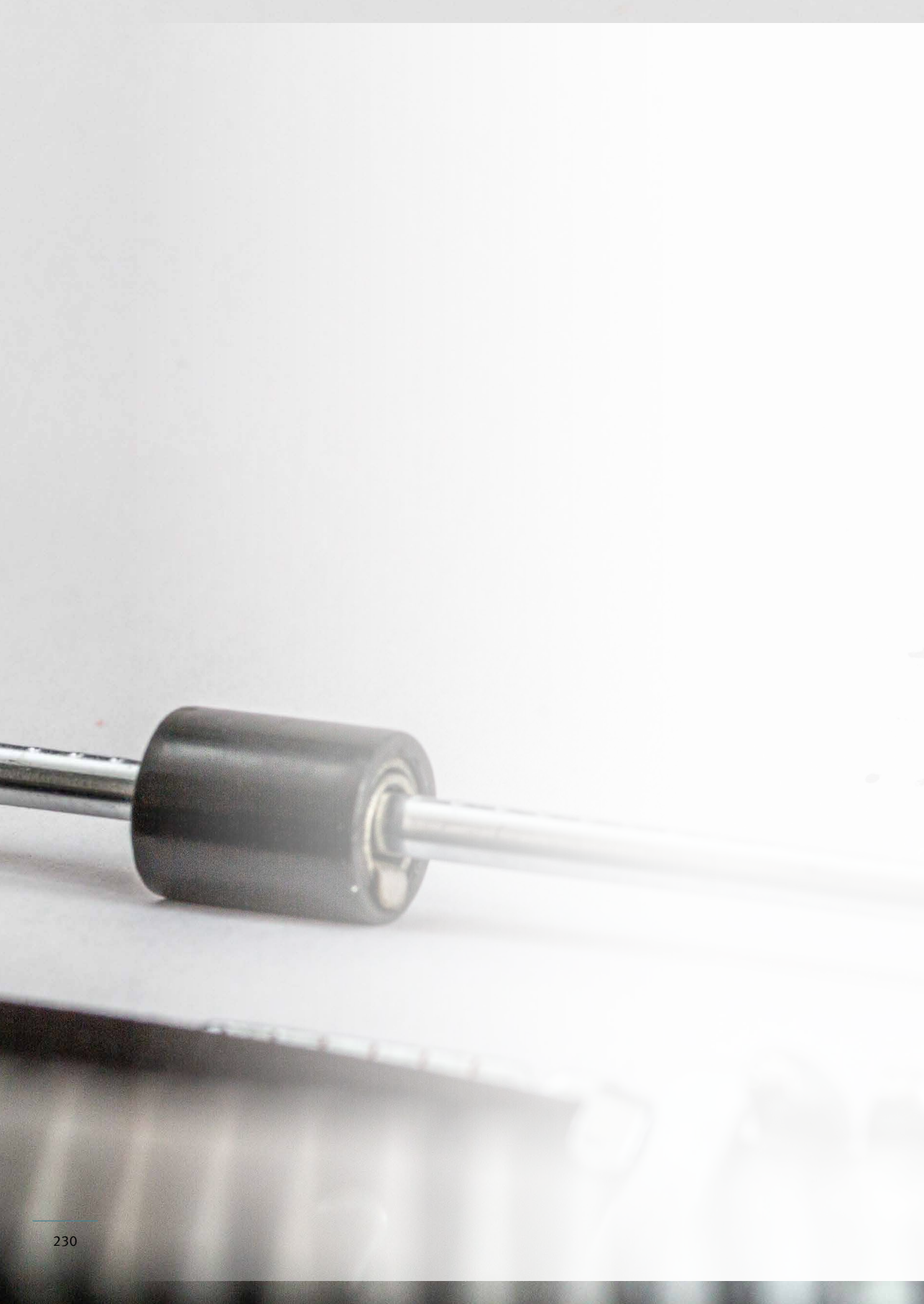

POLICIES AND REPORTS

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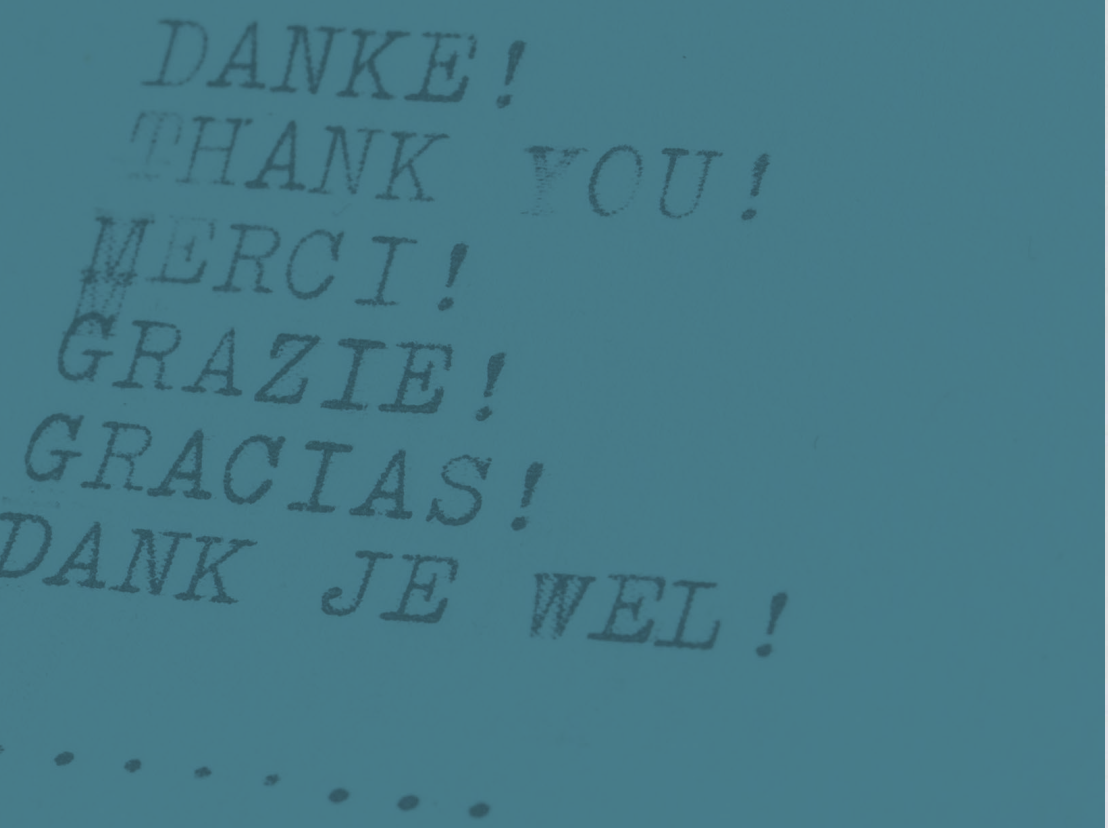

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Transition to a sustainable society is like a journey of discovery into the unknown; it is full of learning, exploration and change. Along the way, we will encounter a host of challenges and problems, but also be surprised by unforeseen positive changes, so are likely to come up with new paths and perspectives never before imagined. After all, what the sustainable society looks like is still unclear and the roads towards it are highly uncertain. Transitions in life sometimes follow the same trajectory.

This acknowledgement brings back memories of the decision that we (three) made to pursue higher education in Europe. Carol Zhang, Vivienne Hu and I, were colleagues (also good friends) working together at Savills in China. I still remember how we encouraged each other to step out of our comfort zone in China, and how excited we were when all of us got accepted to study in Europe. Right then my personal 'life transition' started as I began my PhD study in the Netherlands. This PhD journey has been a roller coaster, bringing me joy, growth and surprises, but challenges and 'dark times' too.

To be honest, the first year of my PhD journey was dominated by uncertainty. The type of academic training in the planning field in China is quite different from that of the Netherlands due to the different perspectives of our physical landscapes. Therefore, for the research itself, I was passionate about my PhD topic, but I was unclear about what my research project would actually be and this made me feel miserable at that time. Living abroad meant going through homesickness, cultural shock, speaking a non-native language, and adapting to a new lifestyle, which increased the challenges associated with rigorous study. Thankfully, I navigated the difficult times of adjustment and soon started to enjoy my life in the Netherlands; and interestingly, it has now become my new 'comfort zone'. Obviously, I have been very lucky to meet so many wonderful people in the Netherlands, and I am immensely grateful for their help, support, company, and guidance throughout this intellectual endeavor.

My PhD research would not have been achieved without the help of my supervisors. First and foremost, my appreciation goes to my promoter, Gert de Roo. Thank you for providing me with the opportunity to work in Groningen, which allowed me to experience different cultural contexts and make friends from all over the world. I can never be thankful enough for this opportunity, and these experiences have indeed helped me to better understand the differences as well as similarities between East and West. Additionally, thanks very much for all the inspirational talks, valuable feedback and support for my work, and for encouraging me to 'dig deeper' into the theoretical arguments, which is not always easy though. Nevertheless, I would not have produced this dissertation without your 'challenge' to my thoughts.

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Friendships established in the Netherlands have been the main source of my joy and strength throughout the time of my PhD. I would like to express my gratitude to the Faculty of Spatial Science of the RUG for the international environment. This gave me the opportunity to meet so many amazing colleagues from all over the world, and many of you have become my very good friends.

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Groningen has already become my second hometown! With the exception of my hometown in China, it is the city where I have spent the longest time. It is the city where I have met so many amazing people. It is the city that has nurtured me and now carries my many unforgettable memories, joys and tears, losses and gains, changes and growth... I have learned a great deal from the Dutch culture and this country; thank you, Groningen, and the Netherlands!

Now it is time to say goodbye and move on to the next chapter of my life. I will remember Groningen fondly and hold close all the beautiful memories of being with you. As Leonard Nimoy tweeted, "A life is like a garden. Perfect moments can be had, but not preserved, except in memory."

Jing Wu
Groningen, 2021

Planning for Energy Transition

Energy transition is crucial for mitigating climate change and has over the past decades risen to become a key international policy ambition. Energy transition is a highly complex, dynamic and multi-dimensional process involving a multitude of actors and networks. Energy transition is also spatially sensitive, and therefore it is crucially linked with spatial planning. Pursuing energy transition in an urban context requires institutional designs and related planning approaches that allow for area-specific solutions. There are two important and ongoing shifts in the governance of energy transition: 1) a shift from government to governance, and 2) increased decentralisation and use of area-specific approaches.

Planning for Energy Transition is particularly interested in how both these possible changes in energy governance can work out within the Chinese top-down political scheme. In response, two analytical lenses are used for studying the institutional design of Chinese urban energy governance. The first lens is that of policy implementation, with a focus on how national energy policies are impacting local energy governance. The second lens is that of integrated and collaborative strategies at a local level, with a focus on cross-sectoral working within governments and between governments and other societal stakeholders.

Planning for Energy Transition highlights the value of an area-specific and associated decentralised approach to energy transition that emphasizes integration of policy and collaboration of actors and institutions into Chinese urban governance. Capitalizing on this added value, however, depends crucially on Chinese centralized-oriented energy governance for both enabling and sufficiently stimulating local willingness and ability.

Jing Wu was born in Jiangsu, China. After working few years at Savills as a senior consultant, she began her PhD research at the Department of Spatial Planning and Environment, Faculty of Spatial Science, University of Groningen, the Netherlands. Her work contributes to area-specific approaches towards energy transition. Her research interest includes spatial planning and governance, integrated energy planning, climate change and sustainable development. She has a particular interest in theories of complex science, decentralisation, transitions and the management.

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