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Integrated transport management: Lessons from a Chinese city

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ABSTRACT

Sustainable transport typically requires a broad spectrum of policy measures, with responsibilities shared by different authorities and with various public values competed with each other, such as commuting, health, spatial quality, and economic development. Designing and implementing integrated policy packages, with consideration for the interdependencies between measures and actors is a promising approach and thus an interesting research topic. A large part of the literature on transport policy looks at separate measures and their effects. These measures in reality always work in constellation with other measures and understanding their dependencies in a way to create synergies through packaging has been the topic of theoretical discussions. However, empirical research on policy packaging is sorely lacking. In this paper, we examine the implementation process of packaging of TM measures from the perspective of actors and their distinct roles and interactions. The data is collected by document analysis and interviews with officers in a Chinese city. Several major problems threatening the implementation of policy packaging are detected, including overlooking implementation at district-level, resource competition between measures, and the absence of integrative supervision. It provides a first answer to the discrepancy occurring in the promise of real-world crafting of well-integrated policies for sustainable mobility.

1. Introduction

In recent decades, sustainable urban transport has been developed with a wide range of measures for transport management (TM) (Bamberg & Schmidt, 2001; Eriksson, Garvill, & Nordlund, 2008; Gärling & Schuitema, 2007), as researchers and policy makers have understood that facilitating demand by building more infrastructure cannot successfully deal with "wicked" transport problems nor contribute to the achievement of a sustainable transport transition (Rittel & Webber, 1973). However, isolated TM measures have shown to be unable to solve transport problems effectively and policy packaging by clever integration of various TM measures is getting more attention (Yang, Veeneman, & De Jong, 2018).

Packaging of TM measures (abbreviated to "TM packaging" in the following content) integrates public values, measures, and actors, leading to higher complexity and uncertainty in design and implementation. Although many cities around the worlds have initiated TM packaging (e.g. Doremus, 2003; Givoni, Macmillen, Banister, & Feitelson, 2013; Taylor, Nozick, & Meyburg, 1997), the effectiveness of the approach is poorly examined and policy makers not only have a poor understanding of what TM packaging means, but also lack a clear perspective on how to apply it. Moreover, existing research on policy packaging mainly focuses on its building blocks (Rogge, Kern, & Howlett, 2017) and ideal packaging process in a more theoretical way (Justen, Fearnley, Givoni, & Macmillen, 2014), and the optimization of measures integration in the design phase (Tuominen, Tapio, Varho, Järvi, & Banister, 2014), but empirical research on the implementation of packaging is still rare. Although there are rich studies on the implementation of various types of policy, the unique characteristics and specific problems of implementing TM packaging demand attention.

Therefore, this study aims to make a step towards filling this gap by laying bare the whole TM packaging process in one Chinese city and explain why seemingly well-designed TM packaging eventually fails to achieve its expected results. Although the conclusion from one case study maybe not representative, the study identifies some major but easily overlooked problems through its deep analysis of a real TM packaging process. It can be a basis for further development of a sound understanding of the implementation of more integrated policy development.

The remainder of the paper is as follows: Section 2 presents the

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literature on TM measures, policy packaging, role analysis, and the research framework. In Section 3 clarifies the approach taken, including the case selection, data collection and analysis is introduced. Section 4 reports the main finding on TM packaging implementation in the case, and Section 5 presents the conclusions and limitations of this paper.

2. Literature review: Levels of government integrating transport policies

To understand better how integrated policy development and implementation through policy packaging could support policies aimed at effective and sustainable transport system, this section firstly discusses measures of transport demand management. In addition, it looks at the literature on the integration of policy development through packaging and the roles of different actors in that process.

2.1. TM measures

TM measures are referred to the policy measures aiming at managing unbalanced transport demand and disorderly traveler behavior (Bamberg & Schmidt, 2001; Meyer, 1999). TM measures can be classified into different categories. For example, based on the difference of transport modes, TM measures include pedestrian, cycling, public transport, and car-related measures; according to different management approaches, they can be divided into campaigning, economic, regulation, service and facility measures (Yang et al., 2018).

Different types of TM measures normally have different levels of effectiveness and feasibility. “Hard” measures (e.g. regulation of transport use) are expected to be more effective but less acceptable to politicians and the public; in contrast, the “soft” measures, such as campaigning and services improvement, are more easily accepted but the effects may be less significant in the short term (Gärling & Schuitema, 2007; Meyer, 1999). The predictability of the effect of TM measures has shown to be not very straightforward. The effectiveness and feasibility of measures can be different in different contexts. In addition, TM measures can also produce negative side-effects. For example, clean car subsidies can encourage people to drive more (Herring & Roy, 2007). Measures can be combined to overcome these issues, but the interaction is not always predictable. Therefore, in the design and implementation process, policy makers could benefit from a better understanding of the interaction between possible TM measures before they select different measures in order to address a specific problematic situation.

2.2. Policy packaging

In order to improve the effectiveness and feasibility of measures and deal with possible negative side-effects mentioned above, policy packaging is widely regarded as a promising approach (Givoni, 2014). Existing research on policy packaging heads towards two directions. One is the more theoretical discussion focusing on establishing normative building blocks for policy packaging (Rogge & Reichardt, 2016), ideal packaging processes (Justen et al., 2014), and optimizing the combination of different measures combination (Tuominen et al., 2014).

The other is focusing on the empirical design and implementation process of policy packaging. For example, Tønnesen (2015) highlights the role of state government engagement for policy packaging implementation, and Davoudi and Sturzaker (2017) discuss the influence of urban forms on designing policy packages. Implementation of policy packaging cannot be conducted without the cooperation of policy actors from different tiers of government. Just as Rogge and Reichardt (2016) highlight, the implementation of policy packaging is embedded across different levels of governance from transnational to sub-municipal levels (Rogge & Reichardt, 2016). Howlett, Vince, and Del Río (2017) emphasize that ‘verticality ’in the involvement of multilevel policy actors makes the policy packaging design and implementation more complex and difficult (Howlett et al., 2017). Conflicts occur regularly between different actors, when it comes to the exact implementation of the packages and their expected effects. Some studies have shown the importance of enhanced intergovernmental cooperation in such a context (e.g. Howlett, How, & del Rio, 2015; Tønnesen, 2015).

The high expectations on policy packaging have led to the development of practical guidelines for transport policy packaging. For example, Sustainable Urban Transport Plans (SUTPs), systematically developed for the European commission, provide an integrated and feasible approach, explicitly including the basic elements, general process, and challenges and lessons based on the practices in different European countries (Rupprecht Consult (editor), 2019).

The literature finds its basis in claims that policy packaging can be better at dealing with complex problems as sustainable mobility, as compared to singular policies. However, the empirical research on policy packaging is still missing and there is a lack of an applicable approach to dissect the complex policy packaging process and identify problems.

2.3. Roles in policy packaging

Policy analysts sometimes frame the policy maker to be one single and purposive actor which takes charge of the whole policy process. However, in reality, policy making and implementation are rarely finished by one single actor or agent (Howlett, Ramesh, & Perl, 2009). This framing easily leads to overlooking the roles and actions of other authorities or groups within the government (Flanagan, Uyarra, & Laranja, 2011). As policy packaging involves multiple values, multiple measures, and multiple actors, it is essential to include these different roles and actions of actors, rather than regard integrative policy making as an action of a single policy maker.

Various roles can be played by individuals, groups and organizational actors. As this study focuses on the roles and actions of government authorities, five major roles are identified in the TM packaging process: policy principals (who identify the problems and initiate policy making process), designers (who design components of packaging), implementers (who execute the designed packaging), sponsors (who provide financial support for the whole packaging process) and supervisors (who supervise performances of other roles). The types of roles and types of actors are not mutually exclusive. One actor may take several roles at the same time, and one role may also be shared by different actors (Flanagan et al., 2011). Moreover, interaction of different roles can be produced only by one actor, for example, one authority can design and implement one policy with its own budget, and different actors interact with each other when they share the same role. In the policy making process, although ideal roles of one actor have been mostly shaped by the formal institution and other historical factors, this actor can still have the freedom to decide which role is primary and to which degree one role can be played.

3. Methods: Process tracing in a single deep case study

The literature above mentions policy packaging, compared to single policies, can be theoretically better at dealing with complex problems for sustainable mobility. However, an earlier empirical assessment of policy packaging and its effect in 22 Chinese cities (Yang, Veeneman, & de Jong, 2020) showed the difficulty of effective policy packaging. The assessment showed limited differences in outcomes between cities with a stronger and lesser focus on policy packaging. The goal of this article wants is to better understand the discrepancy between the theory and reality by assessing the causal chain between the first intentions towards policy packaging and the realisation. This means a more detailed look at the policy packaging process is needed, to understand how documents showing the positive intention on policy packaging relate to a less positive outcome in terms of congestion. In addition, it provides the possibility to look at the effect on other aspects, such as emissions. For that we chose a case study approach (Yin, 2017). In those cases process

tracing was applied, following the developments in the case through time, focusing on the interactions between the different policy measures and how the respective actors sustained the integrated perspective. Bennett and Checkel (2015) make clear that process tracing is a vital method to understand causal mechanisms. We focussed on evidence provided by actors and their motivation for actions while implementing policies for mobility, following the perspective of Dubois and Ford (2015).

The choice was made for a single case study at this initial stage, analysing how theoretical functioning of policy packaging relates to the real-world empirical functioning. The aim was to understand which factors explain that difference. This can be a stepping stone towards including more cases to see whether factors explaining that distinction vary in different cities. However, at this point we had no meaningful way of finding explanatory factors, which would allow us to select additional cases providing alternative factors and answers.

3.1. Case selection

For exploring the problems in the real-world implementation of TM packaging in China, we select the case of *City X*.[1] It is a representatively common city in China in various relevant aspects: geography, GDP per capita, population density, transport infrastructures, etc. First, the city is located in the centre of China. Secondly, it has a GDP per capita in 2016 of about 52,000 yuan, similar to the average level of national GDP per capita 53,980 yuan, (7861 USD, 6915 Euro). Thirdly, the population density of the total area in 2016 is close to the national average level (2408 persons/square kilometer). Fourthly, *City X* is engaging on extending its urban road network structure by constructing several large rings and arterials roads. This trend is also widely spread among many larger and smaller Chinese cities, all implementing policies triggering rapid urban sprawl (Kim, 2019). Above all, the analysis of super-mega cities, such as Beijing, Shanghai, and Shenzhen, would have provided singular data points, hard to reproduce in other cases because of comparability issues with other cities. Because of that, we deemed it more meaningful to select a smaller city as a case representing the status of many more (Chinese) cities. With the rapid urban sprawl and increasing transport problems in the recent decade, the *City X* government focuses both on the supply of urban road infrastructures and the management of transport demand by TM packaging. Just like many other Chinese cities, the local government still cannot successfully design and implement TM packaging. Therefore, the problems revealed in the empirical packaging process can provide useful insights. Finally, access to data and local governments was established in *City X*, allowing for the deep kind of analysis needed in a case study.

3.2. Data collection

In order to fully understand the design and implementation process of TM packaging, we adopted two steps to collect data. As the transport policy package in *City X* is mainly targeting traffic problems in city centre, and less focused on freight transport, mainly passing through city periphery. The measures collected for this paper follow that focus on passenger transport.

The first step was to understand how the policy packaging in *City X* was composed.

For the analysis, a list of possible TM measures designed in Yang et al. (2018) was needed. Then the policy documents from 2011 to 2016 mentioning at least one TM measure were selected to establish to what extent these policy documents were cross-referencing various TM measures. This period covers the time of the whole 12th and the beginning of the 13th 5-year urban plan, which captures enough of a period in which policy packaging could pay off. Then we selected the TM measures from the documents and reconstructed the process. Whatever was mentioned in the selected documents drove our prioritisation of what measures to focus on and what actors to select, related to those measures.

In the second step, 22 interviews were conducted, each lasting around 1 h, in 2019, focusing on key information in transport policy packaging process. From the perspective of institutional research, interview started with organization selection through a snowball approach, finally deciding on eight related authorities from municipal district level (including: Bureau of Transportation (BoT), District Bureau of Transportation (DBoT), Bureau of Urban -rural Planning (BoURP), District Bureau of Urban-rural Planning (DBoURP), Committee of Housing and Urban-rural Development (CoHURD), District Committee of Housing and Urban-rural Development (DCoHURD), Bureau of Police (BoP), Bureau of Finance (BoF)), one city-owned Construction & company (Construction & Investment Co.,Ltd.(CICo.,Ltd)) and one local research institute. Next, to get a comprehensive understanding of each organization's roles, we selected 2 interviewees at least (if possible) from different administrative levels or taking different tasks. The number of interviewees in each organization is shown in Table 1.

The interview questions were semi-structured about the TM measures, with a focus on the dependencies they expected between their key measures and other measures and to what extent they were dealing with the dependencies through the five-year period, to be specific including three key themes: perceptions of current TM packaging, the roles of different authorities in the packaging process and the problems or obstacles they mainly faced during implementation.

3.3. Data analysis

In this paper, we developed a timeline of the implementation of different measures. We looked at the timeline and the role of different stakeholders to evaluate whether the implementation was executed in an integrative approach. We examined first whether the outcomes of TM packaging was satisfactory; we identified obstacles for packaging and integration and how the eventual effect of the process could be explained by the level of success of policy packaging and other possible explanations.

4. Case description

4.1. Examination of TM packaging outcomes

To examine the outcomes of TM packaging which have been designed and implemented from 2011 to 2016, we compared the interim outcomes of the package to the goals set in urban transport plans. As the plans include three main goals that dealing with traffic congestion, especially in city centre areas, improving the facilities and services of public transport and slow traffic, and reduce air pollution mainly caused by vehicle emission, we correspondingly selected four widely-adopted indicators for evaluation: car ownership, traffic congestion, bus mode share rates, and air pollution (Cornet & Gudmundsson, 2015). It should

Table 1
List of organizations of interviewees.

Organizations of Interviews	Number
Bureau of Transportation (BoT)	3
District Bureau of Transportation (DBoT)	1
Bureau of Urban-rural Planning (BoURP)	3
District Bureau of Urban-rural Planning (DBoURP)	2
Committee of Housing and Urban-rural Development (CoHURD)	2
District Committee of Housing and Urban-rural Development (DCoHURD)	2
Bureau of Police (BoP)	3
Bureau of Finance (BoF)	2
Construction & Investment Co.,Ltd.(CICo.,Ltd)	3
Research institute	1

[1] We anonymize the name of City with *City X*, which allows us to openly describe the developments.

be emphasized that as most of the measures still produce effects and some are even not yet fully implemented, it is too early to make a final and comprehensive evaluation of the whole policy package. Therefore, this examination will not provide a rigorous evaluation of the effectiveness of the policies with these indicators, but rather a descriptive review of interim outcomes of the packaging process.

One of the policy goals is dealing with traffic congestion. However, in the five-year period, car ownership in city centre kept showing a rapid increase of about 15% per annum (shown in Fig. 1). Also, traffic congestion is worsening, especially in the city centre and at peak hours. Although *City X* does not have a specific congestion index, most of the interviewees confirm traffic slowing down. As for another goal, air pollution is becoming a growing problem in *City X*. The index of the ambient air quality standard shows the quality rate dropped sharply from 87.4% in 2011 to 72.4% in 2016 (shown in Fig. 1). Although there is no evaluation of the net amount of pollution caused by transport, it is reasonable to infer that the increase is partially due to increasing car purchase and usage, after the *City X* government really pushing forward a reduction of air pollution by the chemical and construction industries at the same time. Last but not least, the bus share rate slightly increased from 15% in 2013 to 23% in 2016, but it was still far below the national average level (40% in 2016). In total, the interim outcome of TM packaging starting in 2011 in *City X* is still far from the goals of 12th 5-year city urban, despite efforts to come up with more integrated transport policies. In the next section, we explore why.

4.2. Examination of various TM packaging elements

To understand to what extent *City X* aimed for policy integration, we measured the extent to which government policy documents including one TM measure, cross-referenced different TM measures and goals. The elements of policy packaging normally include these two parts: goals and measures (Reichardt & Rogge, 2016). Comprehensiveness and consistency are two characteristics we evaluated. The former describes the degree to which TM packaging includes the measures to achieve the goals and the latter one captures whether the elements in TM packaging are well integrated with each other and not contradictory.

First, we looked at the goals of transport system development set in the 12th 5-year city urban plan from 2011 to 2015, which has the characteristic of a general guideline for city development in the following five years. Its goals were emphasized in the 2015 city transport plan and 2016 public transport plan. The goals mentioned throughout the documents and adopted by us as the goals for the overall package TM, included establishing a sustainable and green transport system with low congestion, high traffic safety, and little air pollution. Measures focused on three goals: dealing with traffic congestion, especially in city centre areas, improving the facilities and services of public transport and slow traffic, and reduce air pollution mainly caused by vehicle emission.

When looking at documents that are more aimed at implementation, we see improving the quality of transport of all modes (private cars, public transport, and slow traffic), and other goals of restraining the fast growth and disorderly use of private cars. The documents related to the overall plans and were expected to contribute to the achievement of the primary goal of the whole package.

Of our total list of TM measures (see Yang et al., 2018), 10 types of TM measures were adopted in *City X* between 2011 and 2016. Most of them were implemented in 2011 and were emphasized or updated in 2014 and 2016 (shown in Fig. 2).

The local government preferred TM measures improving services and providing transport facilities to those focusing on campaign, economic incentives and regulation (in Fig. 3). Interviewees did not see significant conflicts between the various TM measures, with the exception of the continuous emphasizes on providing more parking facilities, which does encourage private car use. Moreover, the relatively low diversity of TM measures, for example, the lack of economic tools and regulation, as well as the shortage of slow traffic-related measures, points at an imbalance in promoting sustainable development of the whole transport system. In sum, the packaging components were considered to be consistent and of acceptable comprehensiveness, which means the expected outcome of this TM packaging should be satisfactory.

Based on the examination of TM packaging elements above, it is reasonable to believe TM measures as laid down in the policy documents were relatively well integrated with relatively high coherence and comprehensiveness. However, problems could be expected during the implementation, leading to a less positive overall outcomes of the TM packaging in *City X*.

4.3. Examination of the TM packaging process

As the TM packaging recorded in policy documents only provides a picture of what the packaging is expected to be before implementation, it is more useful to investigate how the TM packaging is perceived by policy makers who really are involved in the packaging process and how it is implemented by the interaction of different authorities.

First, we asked for the perceptions of policy makers regarding the implementation of TM package elements. Among the goals of TM packaging above, one major and short-term goal is to relieve traffic congestion, especially in the city's centre areas. However, the local government policies linked TM to string infrastructure development, making that part of the package. They deeply believed that the continuous construction of urban road networks was vital in dealing with traffic congestion and in attracting investment and tourists outside the city. In doing so, their attention moved away from more "soft" and "indirect" measures that could align demand with supply.

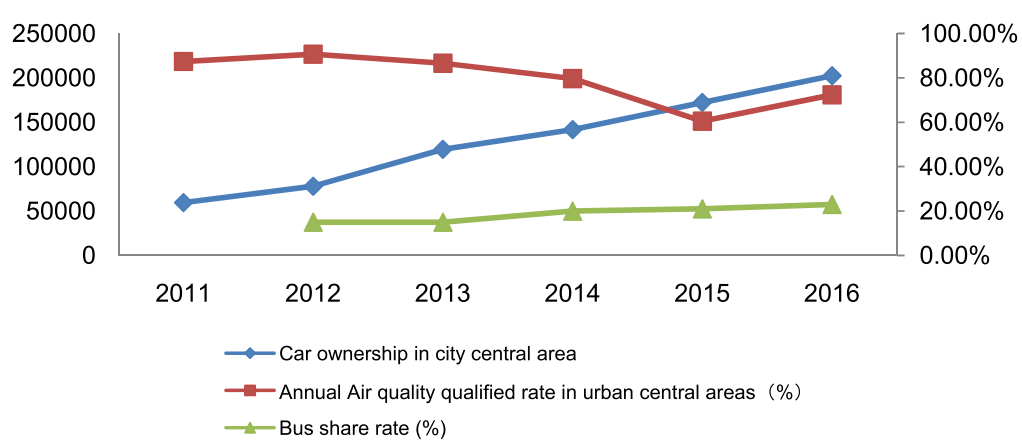

Fig. 1. Car ownership and air quality.

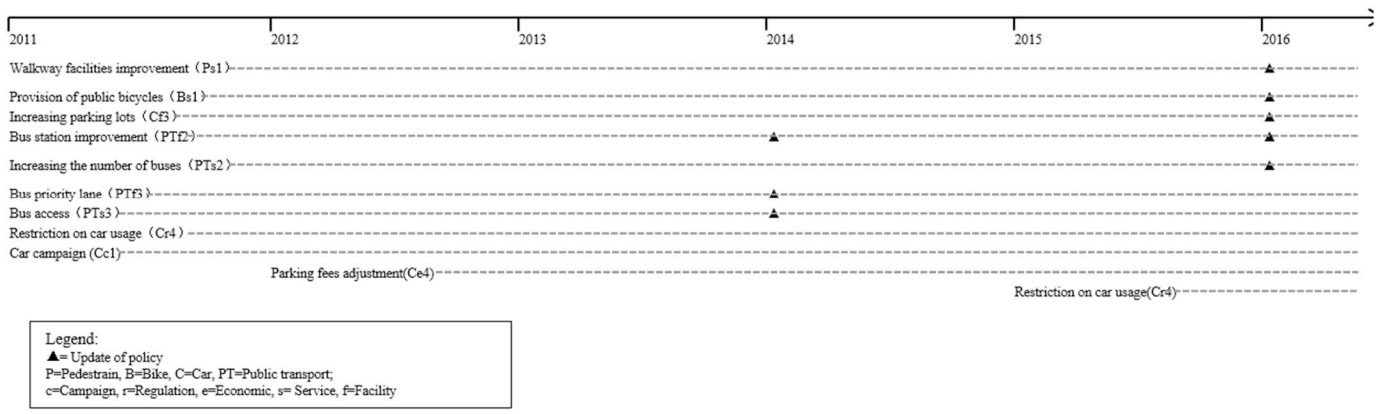

Fig. 2. Time-line of **TM** measures from policy documents in *City X* from 2011 to 2016.

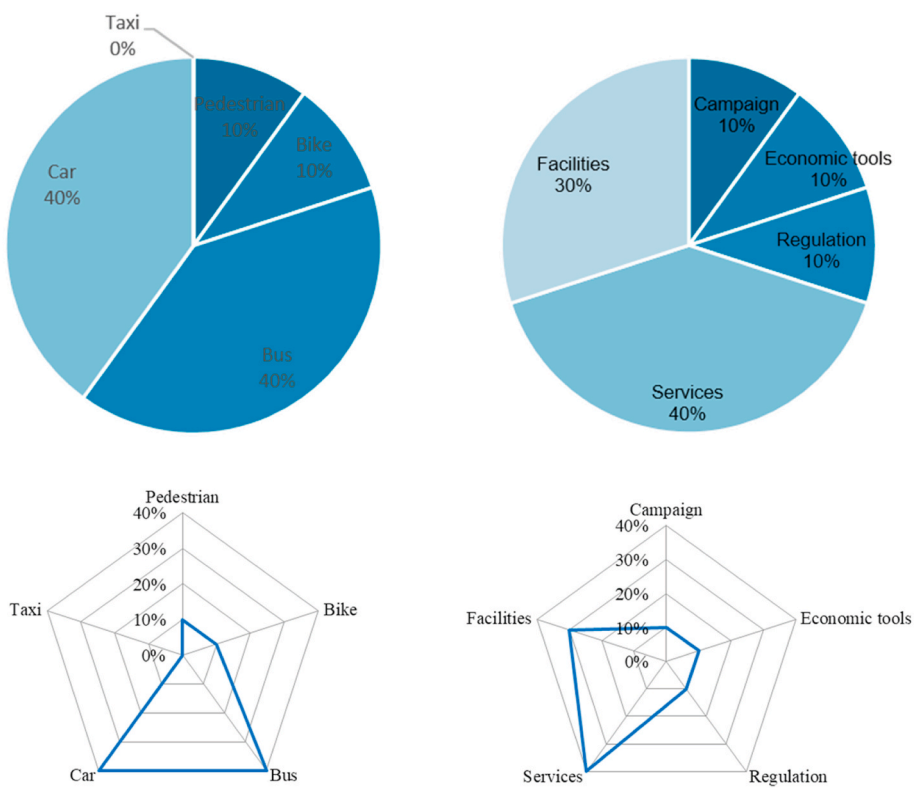

Fig. 3. Classification of TM measures based on transport modes (left) and governance approaches (right).

Also, for the second goal of the mobility plan, they saw the need for the long-term in the development of more facilities and services for public transport and slow traffic. The interviewees all consider this goal as effective, but not feasible in the short term. They provided two distinct reasons. Some of them believe it can be hardly achieved because of the lack of financial investment and administrative support. However, others consider the facilities and services of public transport and slow traffic as already reaching the acceptable level compared to other Chinese cities.

The third goal aimed at establishing green transport systems was a response to the call of higher-level governments. Most local authorities interviewed do not believe the changes in transport systems contribute much to solving air pollution, because they believe this problem is mainly caused by industry rather than transport. Moreover, as for TM measures, interviewees perceive that although it seems that TM measures can be coordinated with each other in packages, there are potential conflicts in their implementation process because of the shortage of financial and administrative sources. In sum, from the interviews, it became clear that the TM packaging, in reality, is perceived by the policy makers not as well-integrated with high coherence and comprehensiveness as the above examination based on policy documents.

The TM packaging process involves various types of authorities across multiple administrative levels and fields, state-owned companies and social groups. In this study, we mainly focus on the roles and actions of government authorities during the whole process. To be specific, MG, BoURP, CoHURD, BoP, BoT and their district-level authorities that DG, DBoURP, DCoHURD, DBoP, DBoT take different but vital roles in TM packaging and their roles in each TM measure design and implementation are shown in Table 2.

4.3.1. *Principals*

The MG and DGs, as the principals, mainly take the responsibility of

Table 2
Types of authorities and types of roles in TM packaging process.

	Starting Date	Updating Date	Level	Principals	Designers	Implementers	Sponsors	Supervisors	Completion
Walkway facilities improvement	2011	2016	Municipal level	MG	BoURP, CoHURD, BoP	*CoHURD*	CoHURD, CICo.,Ltd	*MG*	Medium
			Districtlevel	MG, DG	*DBoURP, DCoHURD, DBoP*	*DCoHURD*	*DCoHURD, CICo., Ltd*	*DG, CoHURD*	Low
Provision of public bicycles	2011	2016	Municipal level	MG	*BoURP, BoT, BoP*	*BoT*	*BoT, CICo.,Ltd*	*MG*	Low
			Districtlevel	MG, DG	*DBoURP, DBoT, DBoP*	*DBoT*	*DBoT, CICo.,Ltd*	*DG, BoT*	Low
Bus station improvement	2011	2014, 2016	Municipal level	MG	BoURP, BoT, BoP	*BoT, Bus company*	*BoT, CICo.,Ltd, Bus company*	*MG*	Medium
			Districtlevel	MG, DG	*DBoURP, DBoT, DBoP*	*DBoT, Bus company*	*DBoT, CICo.,Ltd, Bus company*	*DG, BoT*	Low
Increasing the number of buses	2011	2016	Municipal level	MG	BoURP, BoT, BoP	*BoT, Bus company*	*BoT, CICo.,Ltd, Bus company*	*MG*	Medium
			Districtlevel	MG, DG	*DBoURP, DBoT, DBoP*	*DBoT, Bus company*	*DBoT, CICo.,Ltd, Bus company*	*DG, BoT*	Low
Bus priority lane	2011	2014	Municipal level	MG	BoURP, BoT, BoP	BoT	BoT, CICo.,Ltd	MG	High
			Districtlevel	None	None	None	None	None	None
Bus lines optimization	2011	2014	Municipal level	MG	BoURP, BoT, BoP	*BoT, Bus company*	*BoT, CICo.,Ltd, Bus company*	MG	Medium
			Districtlevel	MG, DG	*DBoURP, DBoT, DBoP*	*DBoT, Bus company*	*DBoT, CICo.,Ltd, Bus company*	*DG, BoT*	Low
Car campaign	2011		Municipal level	MG	BoURP,BoP,DG	BoP	BoP	MG	High
			Districtlevel	MG, DG	*DBoURP, DBoP, DG*	DBoP	DBoP	*DG, BoT*	High
Restriction on car usage	2011	2015	Municipal level	MG	BoURP,BoP	BoP	BoP	MG	High
			Districtlevel	MG, DG	*DBoURP, DBoP*	DBoP	DBoP	*DG, BoT*	High
Increasing parking lots	2011		Municipal level	MG	BoURP, CoHURD, BoP	CoHURD	CoHURD, CICo.,Ltd	MG	High
			Districtlevel	MG, DG	*DBoURP, DCoHURD, DBoP*	*DCoHURD*	*DCoHURD, CICo., Ltd*	*DG, CoHURD*	Medium
Parking fees adjustment	2012	2016	Municipal level	MG	BoURP,BoP,DG	BoP	BoP	MG	High
			Districtlevel	MG, DG	*DBoURP, DBoP, DG*	DBoP	DBoP	*DG, BoT*	High

Notes: 1. MG = Municipal government, DG = District governments, BoT = Bureau of Transportation, DBoT = District Bureau of Transportation, BoURP = Bureau of Urban -rural Planning, DBoURP = District Bureau of Urban-Rural Planning, CoHURD=Committee of Housing and Urban-rural Development, DCoHURD = District Committee of Housing and Urban-rural Development, BoP = Bureau of Police, DBoP = District Bureau of Police, CICo.,Ltd = Construction & Investment Co.,Ltd. (the largest state-owned enterprise in *City X*), BoF = Bureau of Finance, DBoF = District Bureau of Finance. 2. If one authority does not fully take its role, it will be marked in italic format. 3. The degree of completion is mainly drawn based on the subjective evaluation of interviewees, combining with newspapers and authors' empirical witness, as there is no formal evaluation of the policy packaging.

identifying the problems, set the general goals of TM packaging, initiate the policy packaging making process and make the final decisions. They normally do not take charge of the specifics of policy design and implementation which are finished by the various other authorities. MG focuses on making policy packaging covering the whole city areas; DGs, as the subordinate units, mainly manage the packaging referring to their own districts under the guidelines of MG. Compared to MGs, DGs' principal roles less clear and weaker, although MG often inquires DG's advice.

As the initiators and principals of policy packaging, MG and DGs profoundly influence the other authorities' perceptions and preferences regarding TM packaging and determine the priority of policy goals and distribution of various types of resources and tasks. During the interviews, one argument widely shared by interviewees is that "we should keep consistent with the leaders (MG and DGs) spirits and instructions".

4.3.2. Designers

Because of the different distribution of authorities' rights and responsibilities, the designers of packaging changes with different types of TM measures. In *City X*, BoURP and DBoURP focus on the design of the city master plan and provide support to other authorities for other specific transport plans, such as city transport plan and slow traffic plan. BoT and DBoT provide and manage the transport infrastructures outside the city central area and regulate the operational vehicles such as taxis, buses and freights. CoHURD and DCoHURD are responsible for the provision and regulation of transport infrastructures within the city centre. BoP and DBoP take charge of the order and safety of drivers and other travelers. Just like the relation between MG and DG, the authorities in municipal levels take the leading role and their subordinate units mainly provide suggestions and are responsible for their own district matters.

As for the design of different TM measures, besides BoURP, BoT takes the role of designers, BoT mainly designs the public transport related measures and CoHURD focuses on the design of car-related and slow traffic-related measures. Eventually, they integrate the plan of design as a unified TM packages.

4.3.3. Implementers

As for the implementers, besides some of them providing input during designing policies for different traffic modes mentioned above, they are responsible for the corresponding implementation. We see two significant differences between designers and implementers.

The first observation is that the clear boundaries of implementation exist between municipal-level and district-level authorities. The municipal-level authorities seldom provide instructions or orders and

financial support for implementation. This institutional arrangement allows district-level authorities taking more tasks in implementation. In the design phase, the municipality takes little input from the district and takes a hands-off approach and shows limited agency in the implementation phase.

The second observation is that as some authorities (such as BoURP and BoP) as package designers do not participate in the implementation of TM measures. The absence of a role in implementation likely leads to neglecting the difficulties in implementation during the packaging design process. Moreover, the distributions of roles as we defined above reveals that CoHURD and BoT implement measures of services and facilities, which usually require a large amount of investment and long duration of implementation; by contrast, BoP executes the measures about campaigning, regulation, and tolls, which can be done relatively swiftly because of low investment and easy administrative enforcement. Therefore, this design of TM packaging leads to the unequal distribution of tasks and responsibilities among different authorities, which is highly likely to hinder multilevel and interdepartmental cooperation.

4.3.4. Sponsors

There are usually three ways for authorities to raise money for the implementation: financial budgets, state-owned investment platforms, and social investments. In our case, the first two are the main approaches, although social investments, like PPP projects, are getting increasingly popular and promising.

First, in the current, Chinese financial budget system, established after the tax-sharing reform in 1994, established budgets of municipal- and district-level governments are separately and approved by municipal and district People's congresses. It means district-level authorities are not led by municipal supervision in their financial budget management. The primary purpose of this arrangement is to enable district-level governments and authorities financial freedom in their own jurisdictions (shown in Fig. 4). However, this may lead to some negative effects in that administrative mandates or instructions from municipal-level authorities are no longer easily and unconditionally executed by the subordinate authorities in the districts, or superior authorities may overlook the subordinates' budget capacity when distributing tasks, on packaging implementation.

Another sponsor is a state-owned investment and financing platform, called CICo., Ltd in *City X*. With the duty of maintaining state-owned assets, it mainly concentrates on the investment in large infrastructure construction in municipal level rather than isolated district areas, and on the construction of urban road networks, which generate revenues from land use and real estate. In contrast, investing in public transport and slow traffic usually is not the first choice, because they regard it as "high cost but low gain".

4.3.5. Supervisors

The role of supervisors is easily overlooked in TM packaging. With the increase in goals, measures, time and authorities from different levels and sections involved in the packaging process, successful implementation cannot be achieved without supervisors to deal with complexities and uncertainties. Supervision generally comes from the higher-level government.

In this case, the implementation of TM measures at the municipal level is primarily supervised by the municipal government. As for the district-level implementation; the supervision could be carried out both by the corresponding municipal-level authorities and district governments. In the case of *City X*, there is no formal institution of supervision of integrated implementation and the supervision at the district level is much weaker than that at the municipal level.

4.3.6. Summary

Based on the above analysis of authorities' five roles and their performances in the TM packaging, the problems and successful experiences in practices can be summarized as follows. First, the implementation of TM packaging is easily overlooked in the district level (or sub-municipal level), leading to low package completion. As for the roles in the district level, designers have limited influence on the package design, which is mostly determined by the municipal designers. Implementation, however, is carried by the district governments, which control their own human resources and financial budgets. In addition, their direct authorities in the municipal level often do not have an integrative perspective but are responsible for a specific task and public values. If there is a conflict between two leading authorities, implementers often postpone implementation in order to avoid potential administrative risks. For example, BoT distributes the tasks of improving the quality of walkways to all the DBoTs, but the Dongbao district government pushes DBoT and other authorities to focus on the construction of road infrastructures. As a consequence, the DBoT temporarily had to stop the implementation of the TM measures (shown in Fig. 5). Sponsors on the district level have far less budget and financial support, compared to the municipal level. Because of the different economic capacities of district governments, their sponsors from different districts also invest differently in the implementation. Last not the least, the leading authorities and district governments are aware of the implementation difficulties, but supervision on integrated implementation is often absent.

Secondly, theoretically coherent TM measures sometimes conflict with each other in the process of implementation because of the resource competition within one authority or between multiple authorities. One authority is usually responsible for the implementation of several TM measures. For example, BoT had to execute the measures that improve bus stations, increasing the number of buses, and establish bus priority lanes at the same time. Because of the limitation of financial and human

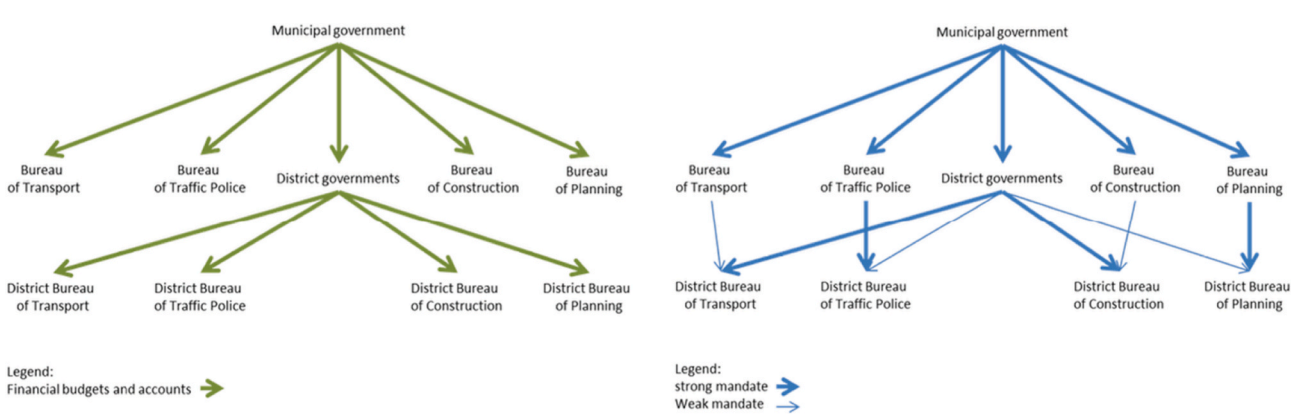

Fig. 4. Financial and agency links between municipal and district levels in *City X* (the structure of budget approval on the left and the structure of administrative mandate on the right).

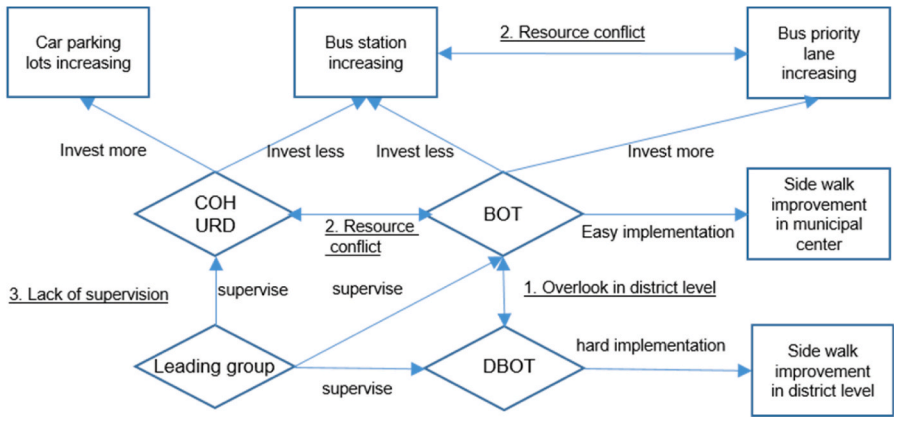

Fig. 5. An example of interactions of actors, roles and measures.

resources and different difficulties of implementation, BoT only fully finished the last measure and had to postpone the first two measures, although three measures together would have provided a better-integrated bus solution. On the other hand, one measures implemented by different authorities also provide a resource conflict. For example, a bus station were implemented and funded by CoHURD and BoT, although CoHURD is also responsible for providing car parking stations. A conflict emerges when one public garden in the city centre would be transformed into a two-floors parking building or a bus hub. Although the BoURP has made the plan of this garden for a new bus hub, the municipal government finally was persuaded by CoHURD to establish a parking building for private car, because CoHURD can took total control of the project budget to solve the severe shortage of parking lots. Therefore, many potential conflicts are likely to appear in the process of implementation, even though the TM packaging at the policy level seems well designed.

Finally, supervisors play a vital role for the successful implementation of TM packaging. With more goals and measures included in the package, the complexity and duration of implementation are also increasing. Supervisors remind actors in other roles to proactively deal with problems in implementation and finish on time. In this case, supervisors are often absent, partly because there is no formal supervisor institution and no urgency from the higher-level governments. The case provided one promising example of a supervisor, the *temporary leading group*. This was initiated by the mayor and composed of the heads of transport-related authorities and districts governments in order to ensure the progress of the project of Xiangshan arterial road reconstruction and integrated governance. As this arterial road is the most important road for daily commuting and tourists' travelling, its implementation receives much attention of local governments and the public. Under the supervision of the leading group, the TM measures related to the infrastructure development have been successfully implemented for this arterial road and its neighbouring district areas.

5. Conclusion: The daunting details of policy package implementation

Designing and implementing integrated policy packages, with consideration for the interdependencies between measures and actors is a promising approach and thus an interesting research topic. However, empirical research on policy packaging is sorely lacking. In this paper, we examine the implementation process of packaging of TM measures from the perspective of actors and their distinct roles and interactions. The data is collected by document analysis and interviews with officers in a Chinese city.

Our study makes three contributions to the literature. First, this paper underlines the importance of implementation for successful policy packaging by an empirical case analysis. A policy package should seek input from those that eventually have to implement the measures. The efforts on designing good policy packaging have been proven meaningful but are not enough for a high performance.

Second, this study demonstrates that to identify key roles played and actions taken by different actors is a meaningful and helpful approach for analyzing complex policy packaging processes and detecting potential problems. The role identification can simplify a large number of complex actors from multi-level and multi-fields into several clear roles which promote a policy packaging process. We can quickly detect problems in a packaging process by checking whether key roles are absent. For example, the absence of supervisors leads to the low completion of many TM measures. Moreover, in current policy packaging studies, conflicts between different roles of one actor, and the conflict between different actors sharing one similar role are often overlooked. Both provide a useful perspective to explain why similar policy measures cannot be equally implemented at different levels of governments and why one authority has different attitudes or preferences to different measures. For example, in this case, CoHURD occupies the role of implementer in the TM measure of walkway improvement, but CoHURD shares the role of designer with two other authorities (such as BoURP and BoP). Therefore, the other designers give extra implementation pressures to COHURD and sometimes requirement from them are easily ignored by CoHURD.

Third, policy makers are suggested to pay much attention to three problems during the implementation of policy packaging. The implementation of TM measures from an integrative perspective is easily overlooked at the lower governmental levels, responsible for the implementation of some of the measures. The same holds for sectorial fragmentation; this can also trigger new dynamics, hampering an implementation of measures that overall makes sense. Implementation gets its own dynamic at different levels of government and different sectoral departments, leading to the low packaging completion. Next, coherent TM measures may conflict with each other in the process of implementation because of the resource competition within one authority or across multiple ones. Last but not least, the absence of supervisors will threaten the whole TM packaging process, especially with growing complexity.

We see two main limitations in this paper. First, the conclusions are based on a single case. Whether its outcomes are robust should been examined in different types of cities within and outside China and in different policy areas. Second, the evaluation of the success of TBM policy packaging is based on limited data, because of issues around data availability.

Although this single case study in China does not provide generic answers to the challenges of policy packaging, it provides first answers on why policy packaging is promising in theory, is indeed adopted often in the design of policies for sustainable transport, but cannot fully deliver on the promise. The key is governance of implementation,

keeping the integrated perspective through different implementing levels of government and departments within the government. A restructuring of financial streams, agency and supervision could be developed to strengthen the integrative perspective. The case does not provide answers as to what could actually work in that field. This is a question for further investigation.

CRediT authorship contribution statement

Wei Yang: Conceptualization, Methodology, Investigation, Data curation, Writing - original draft, Writing - review & editing. **Wijnand Veeneman:** Conceptualization, Writing - review & editing, Supervision. **Martin de Jong:** Resources, Supervision. **Yun Song:** Investigation, Data curation.

Declaration of competing interest

Declarations of interest: none.

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References

Bamberg, S., & Schmidt, P. (2001). Theory-driven subgroup-specific evaluation of an intervention to reduce private car use. *Journal of Applied Social Psychology, 31*(6), 1300–1329. https://doi.org/10.1111/j.1559-1816.2001.tb02675.x.

Bennett, A., & Checkel, J. T. (2015). Process tracing: From philosophical roots to best practices. *Process Tracing: From Metaphor to Analytic Tool, 3–37*.

Cornet, Y., & Gudmundsson, H. (2015). Building a metaframework for sustainable transport indicators - review of selected contributions. *Transportation Research Record: Journal of the Transportation Research Board, 2531*(January), 103–112. https://doi.org/10.3141/2531-12.

Davoudi, S., & Sturzaker, J. (2017). Urban form, policy packaging and sustainable urban metabolism. *Resources, Conservation and Recycling, 120*, 55–64. https://doi.org/10.1016/j.resconrec.2017.01.011.

Doremus, H. (2003). A policy portfolio approach to biodiversity protection on private lands. *Environmental Science & Policy, 6*(3), 217–232.

Dubois, E., & Ford, H. (2015). Qualitative political communication| trace interviews: An actor-centreed approach. *International Journal of Communication, 9*, 25.

Eriksson, L., Garvill, J., & Nordlund, A. M. (2008). Acceptability of single and combined transport policy measures: The importance of environmental and policy specific beliefs. *Transportation Research Part A: Policy and Practice, 42*(8), 1117–1128. https://doi.org/10.1016/j.tra.2008.03.006.

Flanagan, K., Uyarra, E., & Laranja, M. (2011). Reconceptualising the 'policymix' for innovation. *Research Policy, 40*(5), 702–713.

Gärling, T., & Schuitema, G. (2007). Travel demand management targeting reduced private car use: Effectiveness, public acceptability and political feasibility. *Journal of Social Issues, 63*(1), 139–153. https://doi.org/10.1111/j.1540-4560.2007.00500.x.

Givoni, M. (2014). Addressing transport policy challenges through policy-packaging. *Transportation Research Part A: Policy and Practice, 60*, 1–8. https://doi.org/10.1016/j.tra.2013.10.012.

Givoni, M., Macmillen, J., Banister, D., & Feitelson, E. (2013). From policy measures to policy packages. *Transport Reviews, 33*(1), 1–20. https://doi.org/10.1080/01441647.2012.744779.

Herring, H., & Roy, R. (2007). Technological innovation, energy efficient design and the rebound effect. *Technovation, 27*(4), 194–203.

Howlett, M., How, Y. P., & del Rio, P. (2015). The parameters of policy portfolios: Verticality and horizontality in design spaces and their consequences for policy mix formulation. *Environment and Planning C: Government and Policy, 33*(5), 1233–1245. https://doi.org/10.1177/0263774X15610059.

Howlett, M., Ramesh, M., & Perl, A. (2009). *Studying public policy: Policy cycles and policy subsystems* (Vol. 3). Oxford: Oxford university press.

Howlett, M., Vince, J., & Del Río, P. (2017). Policy integration and multi-level governance: Dealing with the vertical dimension of policy mix designs. *Politics and Governance, 5*(2), 69. https://doi.org/10.17645/pag.v5i2.928.

Justen, A., Fearnley, N., Givoni, M., & Macmillen, J. (2014). A process for designing policy packaging: Ideals and realities. *Transportation Research Part A: Policy and Practice, 60*, 9–18. https://doi.org/10.1016/j.tra.2013.10.016.

Kim, S. (2019). Urban development and landscape change in the Yangtze River Delta region in China. *The International Journal of Sustainable Development and World Ecology, 26*(2), 141–153.

Meyer, M. D. (1999). Demand management as an element of transportation policy: Using carrots and sticks to influence travel behavior. *Transportation Research Part A: Policy and Practice, 33*(7–8), 575–599. https://doi.org/10.1016/S0965-8564(99)00008-7.

Reichardt, K., & Rogge, K. (2016). How the policy mix impacts innovation: Findings from company case studies on offshore wind in Germany. *Environmental Innovation and Societal Transitions, 18*, 62–81. https://doi.org/10.1016/j.eist.2015.08.001.

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*(2), 155–169.

Rogge, K. S., Kern, F., & Howlett, M. (2017). Conceptual and empirical advances in analysing policy mixes for energy transitions. *Energy Research and Social Science, 33*, 1–10. https://doi.org/10.1016/j.erss.2017.09.025.

Rogge, K. S., & Reichardt, K. (2016). Policy mixes for sustainability transitions: An extended concept and framework for analysis. *Research Policy, 45*(8), 1620–1635. https://doi.org/10.1016/j.respol.2016.04.004.

Rupprecht Consult (editor). (2019). In *Guidelines for developing and implementing a sustainable urban Mobility Plan*. Retrieved from https://www.eltis.org/sites/default/files/sump-guidelines-2019_mediumres.pdf.

Taylor, C., Nozick, L., & Meyburg, A. (1997). Selection and evaluation of travel demand management measures. *Transportation Research Record: Journal of the Transportation Research Board, 1598*(971114), 49–60. https://doi.org/10.3141/1598-08.

Tønnesen, A. (2015). Policy packages and state engagement: Comparing car-use reduction policy in two Norwegian cities. *Journal of Transport Geography, 46*, 89–98.

Tuominen, A., Tapio, P., Varho, V., Järvi, T., & Banister, D. (2014). Pluralistic backcasting: Integrating multiple visions with policy packages for transport climate policy. *Futures, 60*, 41–58. https://doi.org/10.1016/j.futures.2014.04.014.

Yang, W., Veeneman, W., & De Jong, M. (2018). Transport demand management policy integration in Chinese cities: A proposed analysis of its effects. *Energies, 11*(5), 1126. https://doi.org/10.3390/en11051126.

Yang, W., Veeneman, W., & de Jong, M. (2020). Measuring the effects of integrated transport policy: A qualitative comparative analysis of transport demand management policies in 22 Chinese cities. *Transportation Research Part A: Policy and Practice*. Manuscript submitted for publication.

Yin, R. K. (2017). *Case study research and applications: Design and methods*. Sage publications.