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Rules for the Governance of Transport and Land use Integration in High-speed Railway Station Areas in China: The Case of Lanzhou

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ABSTRACT

The rapid high-speed railway development in China has faced many institutional challenges for the integrated development of transport and land use in station areas. This paper aims to gain insight into the institutional rules that structure the actors' interactions and how they influence the integrated development in station areas. The Institutional Analysis and Development framework has been applied to a specific action situation, named Lanzhou West HSR station area in China. The findings from interviews, document analysis, and field visits reveal that Chinese institutional rules obstruct interactions between actors, thereby hampering the integrated development of functions in HSR station areas.

摘要

中国高速铁路的快速发展使站区交通和土地利用的综合发展面临着许多制度上的挑战。本文旨在深入了解构建行为者互动的制度规则，以及它们如何影响站区的综合发展。制度分析和发展框架已被应用于一个具体的行动情况，即中国的兰州西高铁站区。访谈、文件分析和实地考察的结果显示，中国的制度规则阻碍了行动者之间的互动，从而阻碍了高铁站区功能的综合发展。

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Rules; institutional analysis; integration of transport and land use; high-speed railway; station area

1. Introduction

Although there has been an increasing interest in the integration of transport and land use for decades, the planning of transport and land use is still separated (Graham and Marvin 2001, Hull 2008, Ki-moon 2013, van Geet *et al.* 2019). Scholars especially focus on the integrated planning of public transport nodes such as railway stations because of the dual functions of station areas, namely nodes in networks and places in cities (Bertolini and Spit 1998, Curtis and James 2004, Haywood 2005, Bruinsma *et al.* 2008, Zemp *et al.* 2011). Due to these functions, high-speed railway (HSR) stations commonly act as an incentive for large-scale urban regeneration projects which aim to spur the economy, boost property value and put forward a series of urban planning projects (Willigers and Van Wee 2011). To bring the potential social, environmental and economic benefits, integrated development of these functions is crucial for a

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successful railway station area (Peek *et al.* 2006, Marshall and Banister 2007, Trip 2008, Cervero and Murakami 2009).

There is an increasing body of literature that emphasises the importance of institutional factors in achieving integration of functions and determining station area development (Bertolini and Spit 1998, Curtis and James 2004, Hall 2010, Curtis 2012, Searle *et al.* 2014, Curtis and Low 2016, Heeres *et al.* 2016). To exploit the development potential of a station area, actors from several organisational tiers and different functional sectors need to cooperate and coordinate (Givoni 2006, Peters 2009, Feliu 2012). These actors include national and local governments, railway companies, real estate companies, private investors, and property owners (Wolfram 2003). This poses great challenges to the integrated development and planning of a station area since these actors have different perspectives, interests and knowledge (Peek and Louw 2008, Zemp *et al.* 2011, Tornberg 2012). Studies argue that the governance of integrated functions planning is difficult since it is affected by institutional frameworks and multiple actors which cause various cross-boundary issues and uncertainties (Curtis and James 2004, Givoni and Banister 2006, Kokx and Van Kempen 2009, Salet *et al.* 2013, Johansson *et al.* 2018). It needs policy integration of transport policy and land use planning to achieve cross-cutting aims rather than sector-orientated objectives (Geerlings and Stead 2003, Stead and Meijers 2009).

China is a latecomer to HSR construction, but its HSR network is developing rapidly. More than 80% of major cities in China will be connected by the HSR network. There will be around 1000 HSR stations in 2030. However, the integration of transport and land use of Chinese HSR station areas faces many challenges, especially institutional barriers (Yang and Han 2020). Urban and transportation functions around many HSR stations are severely fragmented, resulting in inconvenient interchanges and the slow development of urban functions such as retail and business (Chen and Wei 2013). The news often reports that large numbers of passengers are stranded at HSR stations due to the lack of well-functioning public transportation. Local governments have been criticised for wasting land because of planning large HSR station areas (Dai and de Vries 2018).

Most studies have focused on how HSR affects regional economic development in China (Zhang *et al.* 2019). Far too little attention has been paid to the institutional aspects of HSR station area development in China (Yin *et al.* 2015). A comprehensive and in-depth understanding of the institutional conditions which structure actors' interactions in the integrated planning process of the station area is needed (Tan *et al.* 2014, Isaksson *et al.* 2017). A focus on institutions can help identify governance solutions for station area development, particularly by looking at how institutional rules influence the development and delivery of the functions of a railway station area.

To gain insight into how institutions hamper the integration of transport and land use, we selected a typical case in the north-western China called Lanzhou West HSR station area. It is one of the most important nodes in the Chinese railway network and the largest regional hub in western China, so its development was deemed critical by China Railway (CR). The local government also attaches great importance to the planning of the station area because it is a vital node in the Silk Road Economic Belt. The local government expects that the HSR station area could boost the local economic development. However, the urban functions' development of the station area is still far behind schedule. The operation of HSR started in 2014, but part of the commercial area and public squares are still under construction in 2021. The same situation exists in many HSR station areas in economically underdeveloped Chinese cities.

The main aim of this paper is to understand how institutions shape the interactions of actors and thereby influence the integration of transport and land use in Chinese HSR station areas. Institutions can be regarded as sets of rules (Ostrom 2005). Rules guide and constrain the complex planning process, for example, the HSR station area development (Alexander 2005, Salet 2018). To systematically analyse the rules and achieve the research aim, we adopted the institutional analysis and development (IAD) framework. We applied this framework to analyse the development of

Lanzhou West HSR station area. Based on this analysis, we summarise how the rules influence actors' interactions and decide the development situation of functions. We conclude this paper by discussing what rules could be improved to facilitate the integration of transport and land use in Chinese HSR station areas.

2. Analytical Framework: Explaining the Functioning of HSR Station Areas from a Rule-based Perspective

The integration of transport and urban functions and eventual urban development could be considered as the outcome of the actors' interaction process (Stead 2008, van Karnenbeek and Janssen-Jansen 2018). The behaviour and interactions of actors in the planning process are influenced and structured by institutions (Ostrom 2009, March and Olsen 2010). Therefore, institutions affect the extent to which the integration of transport and land use functions is achieved (van Geet *et al.* 2019).

Institutions are defined as any form of human-made rules for constructing social interactions and can be regarded as sets of "the rules of game" (Ostrom 1986, North 1991, Ostrom 2011, Scharpf 2018). Rules are "shared understandings among those involved that refer to enforced prescriptions about what actions (or states of the world) are required, prohibited, or permitted" (Ostrom 2011, p. 17). Institutions consist of both formal rules and informal rules where the former refer to rules that are extracted from laws, policies and regulations and promulgated through formal governmental channels while the latter are shaped by habits and norms and established outside formally sanctioned channels (North 1991, Helmke and Levitsky 2004). Rules guide individual and collective actions and interactions of actors in decision-making processes according to regulations, laws, norms and habits (Ostrom 2009, Ostrom 2014). Rules decide how information is communicated, how interests are distributed, how disagreements are solved and how actors can enter and leave the planning process (Edelenbos and Klijn 2007). Ostrom (2009, 2011) classifies them under seven categories: position rules, boundary rules, aggregation rules, information rules, payoff rules and scope rules (see Table 1).

The analysis of rules offers an in-depth understanding of the power to make decisions, to perform reward or sanction actions, and their effects on interactions of actors in the planning processes (van Karnenbeek and Janssen-Jansen 2018). When it comes to HSR station areas, rules are of influence and constrain the planning process of these areas. Understanding these rules is essential for investigating the integration of transport and urban functions (Alexander 2005, Kim 2011, Salet 2018).

The integration of land use and transport in station areas could be specified as a balanced development of node and place functions (Reusser *et al.* 2008, Chorus and Bertolini 2011). Station areas represent nodes in networks and places in cities. The node function relies on both the HSR stations' positions in the national and urban transport networks, whereas the place function is determined by location, land use and spatial quality (see Bertolini and Spit 1998). Based on interviews with actors, Peek *et al.* (2006) argue that an integrated station area should be a transportation node, a

Table 1. Types of rules in IAD (Sources: Ostrom, 2009, 2011, Ostrom and Basurto 2020).

Rules	Definition
Position rules	Create positions and specify actors who can hold positions
Boundary rules	Define how actors can occupy or leave positions
Choice rules	Clarify the allowed, constrained or prohibited action for actors in a position
Aggregation rules	Regulate "who is to decide which action or set of activities is to be undertaken" and influence how decisions are made
Information rules	Are about the extent to which information is available to actors, authorise the communication channels and specify form and language of communication
Payoff rules	Specify the interests and costs assigned to actors as results of series of actions and outcomes. These rules create deterrents or incentives for actions
Scope rules	Delimit the factors that may result in certain outcomes of an action situation

Table 2. Functions of railway stations (Source: adapted from Zemp *et al.*, 2011).

Function	Explanation	Subject
Function1_(F1) Link catchment area and transport network	• To select a suitable location for the station to link the catchment area and transport network • The quality of catchment area is determined by average travel time to centres and number of workplaces, shops and residents	Transport
Function2_(F2) Support transfer between modes of transport	• There should be enough space for vehicles of all transport modes and for waiting area • Convenient interchange	Transport
Function3_(F3) Facilitate commercial development	• Provide urban functions such as shopping, leisure and business to generate additional revenues and to integrate into surrounding communities	Land Use
Function4_(F4) Provide public space	• Serve as a public space for social events and activities	Land Use
Function5_(F5) Contribute to the identity of the surrounding area	• Contribute to the distinctiveness of the area and connects to the surrounding area	Land Use

connection point for multiple transportation modes, a meeting place, and a city centre. Zemp *et al.* (2011) have further reformulated the transport function and land use function of station areas into five functions: linking catchment area and transport network, supporting transfer between modes of transport, facilitating commercial use of the station area, providing public space, and contributing to the identity of the surrounding area (Table 2).

A variety of approaches can be adopted to perform an institutional analysis (Hollingsworth 2000). In order to make a detailed and systematic analysis of the seven sets of rules in the planning process of HSR station areas and their impact on transport and land use functions, we have adopted the institutional analysis and development (IAD) framework. This framework provides a rich understanding of the context, the setting within which rules operate and change over time (Ostrom 2005, Ostrom 2009, McGinnis 2011, Ostrom 2011). It "assigns all relevant explanatory factors and variables to categories and locates these categories within a foundational structure of logical relationships" (McGinnis, 2011, p. 169). It uses the concept of an "action arena", which is the virtual locus of the action situation, the actions and interactions between the different actors on the issue at hand (Ostrom 2009) (see Figure 1). Actors here are organisations or social entities that have the ability to assert influence or act on a decision (Enserink *et al.* 2010). In an action arena, actors interact, exchange resources and solve problems. An action arena and interactions of actors are influenced by exogenous variables, for example, rules and geophysical circumstances (Ostrom 2009). This research aims to unravel the

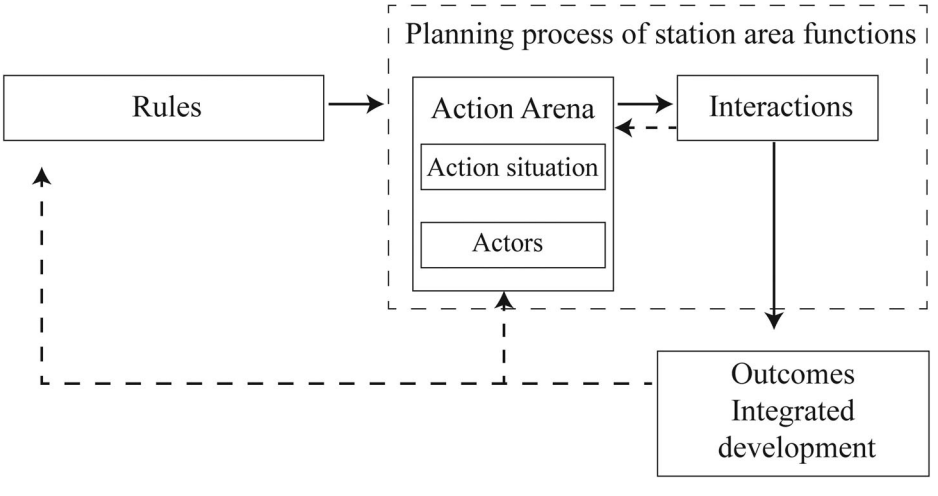

Figure 1. Institutional Analysis and Development framework applied to HSR station area development and functioning (Source: adapted from Ostrom, 2009).

institutional influences on HSR station area planning and thus focuses on rules that structure and guide the action arena and interactions. Action arenas and the interactions of actors, in this case, refer to the planning process of transport and urban functions within the HSR station areas. For a particular case, we analyse how the actors and their interactions have contributed to each of the functions of HSR station areas as specified in Table 2, and summarise how different rules have influenced the HSR station area development in this case, which we consider to be comparable to HSR station area developments in other less economically developed cities in China.

3. Methodology

3.1. Lanzhou West HSR Station Area as a Case

A case study illustrates an in-depth understanding of particular problems or places and a broad understanding of relevant contexts and issues (Seawright and Gerring 2020). This paper uses the single case study method to gain a thorough understanding of a particular problem: how institutional rules obstruct or support integrated transport and land use, affecting the performance of HSR station areas in China. Lanzhou West HSR station was chosen as an exemplifier station for less economically developed cities in China. These cities usually face many challenges to developing station areas due to limited resources, inadequate funding, and lack of institutional innovation (Deng *et al.* 2019, Wang *et al.* 2021). Previous literature has focused mostly on HSR station areas in mega-cities, such as Shanghai Hongqiao Station and Wuhan Station (cf. Dai and de Vries 2018, Yang and Han 2020), while HSR station areas in these less economically developed cities are more numerous and problematic. Lessons from these large cities may not apply to less economically developed regions and cities, as large cities often enjoy unique policies and institutional settings. Thus, the Lanzhou case shows a more representative picture of the problems of the HSR station area development and its lessons could be applied to a wider range of Chinese cities. Moreover, the authors had special access to relevant actors and materials, which improved the comprehensiveness and accuracy of the information, and gave them a unique insight into the dynamics of the planning and development of this station area.

Lanzhou is the capital of Gansu province, with a population of 3.31 million (Lanzhou Statistics Bureau 2020). It plays a critical role in northwest China due to its geographic location and industrial development. The Lanzhou-Urumqi high-speed railway is one of the most crucial national-level railway projects. As the start of the HSR line, the Lanzhou West HSR Station was planned in 2009 and constructed in 2013. The station opened in 2014 with a total construction area of 260,000 m^2 (LRTC 2019). It was designed as a comprehensive transportation hub which consists of HSR, inter-city railways, conventional railways, buses and metro lines. The number of annual passengers was around 10 million (Interviewee 2).

The Lanzhou West Station area was an urbanised industrial area, occupied by factories and warehousing (Figure 2). It is located 8km from the city centre. The station area is around 1.02 km^2 and the construction investment is around CNY9.3 billion (interviewee 5). The station area has been planned to become the new Lanzhou city centre (Figure 3). In 2019, the Lanzhou municipal government published *Implementing Opinions on Promoting the Lanzhou HSR Economic Development*, which emphasised the pronounced effect of HSR on social and economic development. In this plan, the municipal government proposed constructing a Central Business District around the station and accelerating the construction of projects on station squares, including a commercial centre, business and office areas, leisure and shopping areas, and a tourism and cultural centre.

3.2. Data Collection and Analysis

Revealing rules can be difficult since they have often evolved over lengthy periods of time and are implicitly accepted by actors rather than explicitly written down (Ostrom 2009). Some of these rules

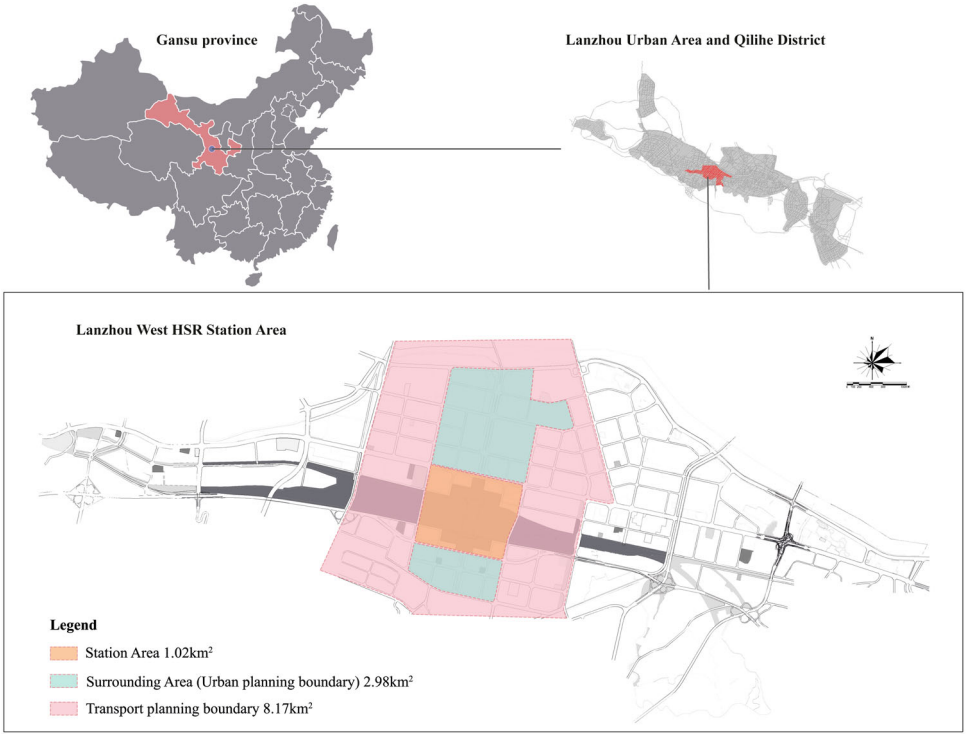

Figure 2. Lanzhou West HSR Station area map (Source: the authors).

are defined by formal policies, law and regulations, while some of them are influenced by consensus or customary law as part of a set of customs, practises and beliefs among different actors. To overcome this difficulty, we first collected available and accessible regulations, legislation, spatial plans, and railway plans to understand the institutional settings and rules of HSR station area development (see Table A1). Second, based on the five functions in Table 2, we designed semi-structured

Figure 3. Lanzhou West HSR station (Source: the authors).

interview guidelines and interviewed the main actors face-to-face. Fieldwork was conducted from December 2018 to March 2019, in October 2019, and in January 2020. A snowball sampling method was used in which initial interviewees recommended other appropriate informants (Lewis-Beck *et al.* 2003). The interviewees were experts from CR, China Railway Lanzhou Branch (CRLB), China Railway First Survey and Design Group (CRFSDG), Lanzhou Rail Transit Company (LRTC), Tongji Architectural Design Co., Ltd. (TJAD) and Lanzhou Urban-Rural Planning Bureau (LURPB) (see Table A2). We interviewed the actors who made decisions for transport and land use functions in the HSR station area to find out how they interacted with other actors, and what rules influenced their behaviour during the planning process of each function. All interviewees were informed of the research objectives, the purposes of the interviews, and how the data would be used and reported. Some experts were interviewed several times to follow the development of functions.

Then, we adopted the content and discourse analysis method to code the documents and interview transcripts in Nvivo (Flick 2013). Ostrom's seven rules (Table 1) were used as the coding framework to analyse the influence of each of the rules on the planning and development of the Lanzhou West HSR station area, the results of which are summarised in Table 3. In this table, the second column contains the rules that influence actors' interactions and the development of functions in the HSR station area. They are referred to in the following sections by the codes listed in the first column (e.g. ^{P1}). The third column explains which function or actor has been influenced by the rules. The fourth column indicates the document and interview sources for each rule.

4. Analysis of the Action Arena, Interactions and Outcomes

4.1. Actors and Rules

Since the economic reforms began in 1978, the Chinese national government has delegated many governance responsibilities and economic decision-making power to local governments (Chien 2010), which has given local governments a decisive role in local development (He and Wu 2009). Therefore, there were two types of positions for actors in the decision-making process of HSR station area development, railway positions and urban positions $^{(P1)}$. The Ministry of Railways (MOR) occupied the railway position and initiated the Lanzhou-Urumqi HSR line $^{(P2)}$. MOR, as the competent department of railways, was responsible for all railway affairs and supervised all railway departments across the country. In 2013, MOR was disbanded and replaced by China Railway (CR) to improve efficiency and attack corruption. MOR (CR) had the authority to approve the planning and design of the HSR and the stations. It also had the core technologies of HSR and the power to regulate the whole railway network $^{(B2;\ I1)}$. CRLB, its local branch, was responsible for the management and operation of railway stations in Gansu province $^{(P3)}$. CRFSDG provided scientific studies and suggestions for railway lines and stations, such as the location choice and the layout of railway stations $^{(P3;\ I1)}$. Railway actors' perception was that the station area was a place to provide services for passengers $^{(S1)}$. Passengers' convenience and safety in entering and exiting the station were paramount in their efforts (Interviewee 5). Railway actors cooperated in many projects and they shared the same convictions and perceptions about the functions of stations and station areas $^{(P3,\ B2,\ I1)}$.

Urban positions were mainly occupied by provincial and local governments $^{(P4)}$. The Gansu provincial government was responsible not only for cooperating with MOR on the planning, investment and construction of the HSR in Gansu province, but also for collecting information from municipal governments and balancing the interests $^{(I3)}$. The Lanzhou municipal government had the authority to decide the land use rights and approve the development of the station area and its surrounding areas $^{(B3)}$. Its two subdivisions were involved in particular: the LURPB[1] planned the station area, and the Lanzhou Transport Bureau (LTB) provided the local public

Table 3. Rules affecting Lanzhou West HSR station area development (Source: the authors).

Code	Rules	Influence	Sources
Position rules			
P1	Two types of positions of actors involved in the process are: railway positions and urban positions. The MOR (CR), provincial and local governments were the main actors in the railway project.	Actors	Interviewee 1,2,3
P2	MOR(CR) was the initiator of HSR station planning and development.	Actors	Interviewee 1,2,3; D1
P3	Railway actors belonged to MOR and they still held the railway positions after the disbandment of MOR.	Actors; F1; F3	Interviewee 1,2,3,4; D1
P4	Urban positions were mainly held by the provincial government and the local government.	Actors; F1; F2; F3; F4; F5	Interviewee 3,4,6,8; D2
Boundary rules			
B1	MOR(CR), CRLB, provincial government and local government invested in the joint venture, Lanxin Railway Ganqing Ltd., and provided land to occupy the positions.	Actors; F1	Interviewee 2,3; D7, D8
B2	HSR technology and HSR-related information were controlled by MOR(CR) which excluded other actors from access and strengthened the dominant position of MOR(CR) in the decision-making process.	Actors	Interviewee 2,3,4
B3	The municipal government could decide on urban actors who might enter a position and be involved in the planning and development process.	Actors; F2; F3; F4; F5	Interviewee 3,6,7; D2, D3, D4
B4	Market actors were excluded from the planning process.	F3	Interviewee 6,8
B5	Citizens were excluded from the planning process.	F4	Interviewee 6,8
Choice rules			
C1	Railway and urban actors' activities are constrained by separate land ownership and hierarchy relationships.	F1; F2; F3; F4; F5	Interviewee 1,2,3,6,8
C2	Lanzhou local government used an informal choice rule by taking advantage of its location and its role as the capital of Gansu province to bargain with MOR(CR) and CRLB.	F1	Interviewee 3,4
C3	Station area was regarded as a general urban area, and standard approval procedures were required. Many choice rules were applicable and conflicted with each other.	F3; F5	Interviewee 6,8
Aggregation rules			
A1	Railway actors were only responsible for railway services.	F1; F2	Interviewee 3,5
A2	Local transport methods were mainly provided and operated by urban actors, so decision-making on local transport methods was dominated by local government.	F2	Interviewee 5,6,7
A3	CRLB made decisions for the retail and restaurants within the station.	F3	Interviewee 2,3,5
A4	LRTC constructed and managed the commercial development in the underground area and in the squares.	F3	Interviewee 6,7,8
A5	CRLB was responsible for the area inside the station building.	F4	Interviewee 3,5
A6	LRTC financed, constructed and maintained the public space in the station area.	F4	Interviewee 6,7,8
A7	The local government has the right to make decisions on the developers of the surrounding area.	F5	Interviewee 6,8; D2, D4
Information rules			
I1	MOR(CR) controlled the information about HSR. CRFSDG was responsible for providing scientific studies for railway lines and stations.	Actors	Interviewee 1,2,3,4
I2	Tongji Architectural Design Co., Ltd. (TJAD) designed the HSR station building, the facilities, the transport system and the urban development plan of the station area.	Actors	Interviewee 6,7,8
I3	The communication channel between railway actors and urban actors was established through the negotiation between MOR(CR) and the provincial government at a high level (*Ludi gaoceng huitan jizhi*).	F1; F3; F5	Interviewee 2,3,4,8
Payoff rules			
PO1	The Lanzhou-Urumqi HSR line and stations were funded by Lanxin Railway Ganqing Ltd. MOR(CR) and CRLB invested around 76% of the total capital, while the Gansu provincial government provided about 12%.	Actors; F1	Interviewee 2,3
PO2	Around 70% of the station area investment was borrowed from banks by LRTC, and 30% of the sources were provided by the local government. LRTC could obtain the rent revenue from the commercial area, parking and two high-rise commercial buildings.	F2; F3; F4	Interviewee 6
PO3	In order to compensate the CRLB for its land loss, the Lanzhou municipal government allocated a new, larger area on the urban edge to the CRLB.	F1	Interviewee 2,3,4
PO4	Considering the local interest, MOR(CR) agreed to build an inter-city railway line and connect it to the Lanzhou New Area.	F1	Interviewee 2,3

(*Continued*)

Table 3. Continued.

Code	Rules	Influence	Sources
Scope rules			
S1	For railway actors, the station area aimed to provide service to railway passengers.	Actors, F1; F3; F4	Interviewee 2,3
S2	The station area was planned to become the new Lanzhou city centre, integrating transport functions with a high-end finance sector, large-scale businesses and exhibition centre, and ecologically responsible residential areas.	F4; F5	Interviewee 6,7,8,9; D13, D19
S3	Planning outcomes depend on the local situation. There was no national-level integrated development policy.	F3; F5	Interviewee 6,7,8

transport services. The Lanzhou municipal government authorised the LRTC, which was a state-owned enterprise (SOE) and responsible for metro development in Lanzhou, to provide funding and develop the station area (B3). The local government was not permitted to issue government bonds, so it appointed LRTC to loan money from banks and invest in public facilities in the station area (PO2). The Lanzhou local government entrusted the TJAD to design the HSR station building, the facilities, the transport system and the urban development plan of the station area (I2). For urban actors, the Lanzhou-Urumqi HSR line was crucial for the future economic development of Gansu province. The development of HSR and station area was expected to spur the economy and bring investment to Lanzhou. They considered the station as a catalyst for economic upgrading of the surrounding area, from warehousing and factories to commercial and residential functions (S2).

Railway actors and urban actors had to cooperate to provide the funding and land for the HSR station area. MOR, CRLB, Gansu provincial government, and Qinghai provincial government formed a company for funding in 2009, ie. Lanxin Railway Ganqing Ltd. (P1, B1). The joint venture provided the opportunity and the position for the provincial government to negotiate for local interests (PO1). The land for the Lanzhou West HSR station and tracks was allocated to CRLB by the national government, while the land surrounding the station was expropriated by the Lanzhou municipal government (B3). Figure 4 shows the formal institutional relationship between these actors.

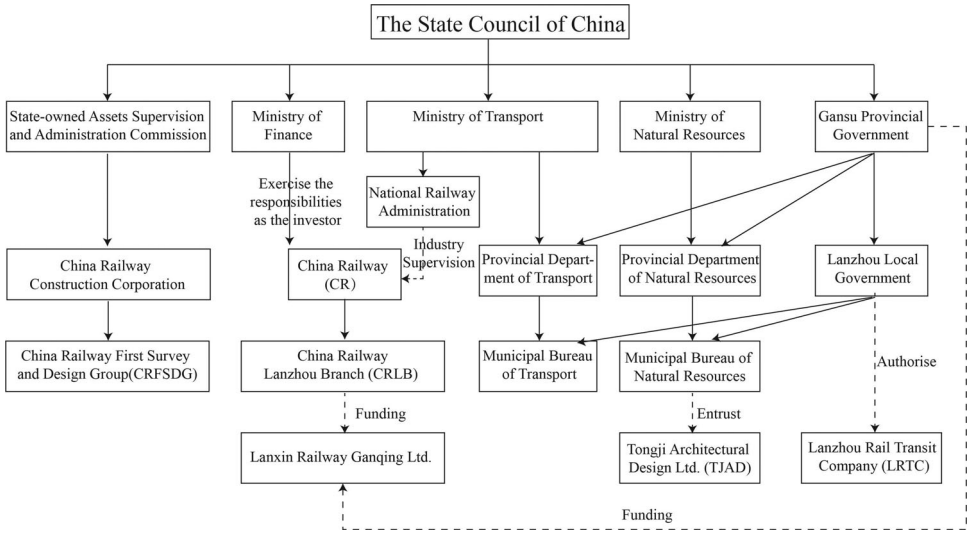

Figure 4. Formal institutional relationships among actors (Source: the authors).

4.2. Functions as Outcomes of Actors' Interactions and Rules

4.2.1. Function 1 Link Catchment Area and Transport Network

The location of the station had to be determined by both railway actors and urban actors. Although the railway actors dominated the decision-making process since they possessed the authority, knowledge, information and part of the financing resources (P2; P3; A1; I1), the land resources and part of the funding were controlled by urban actors (P4; B1; C1; PO1). The main challenge was to balance the interests of railway actors and urban actors (Interviewee 2). Railway actors required that the station's catchment area be large enough to accommodate the station and its facilities, and a convenient interchange between HSR and conventional trains (Interviewee 4). According to urban actors, the cost of land expropriation should be affordable, and the area should have growth potential. Moreover, land is particularly scarce in Lanzhou due to its geographical situation, making it difficult to select a location.

MOR and CRFSDG suggested connecting the HSR line with the existing Lanzhou Railway Station for technical reasons (Interviewee 3) (I3). Transferring between the conventional railway and HSR was also convenient for passengers (Interviewee 5). However, the local government could not afford the cost of land acquisition to expand the station area (interviewee 1). Due to insufficient land and funding, the Lanzhou municipal government proposed locating the HSR station in the Lanzhou New Area, a new town in Lanzhou (Interviewee 2) (I3). The local government regarded the HSR station as a great opportunity to stimulate the development of the new town. Nevertheless, this proposal provoked opposition from railway actors because the new town is 40km away from the Lanzhou urban area and 74km away from Lanzhou Railway Station. The CRLB then proposed locating the new HSR station on the land of Lanzhou West Freight Station (Interviewee 2). The distance between the HSR station and the existing railway station would be acceptable for transferring passengers. Meanwhile, most of the land in the freight station area belongs to the CRLB. The surrounding land of the station area belonged to several SOEs, including Lanzhou Machine Tool Factory and Lanshi Group. The local government only needed to exchange land with these SOEs. Thus, land acquisition costs were minimised (Interviewee 4). Informal payoff rules (PO3; PO4) between railway actors and urban actors also facilitated the process to reach an agreement. All actors agreed to move the freight station to the north of Lanzhou and build the Lanzhou West HSR Station in this area.

Lanzhou local government used an informal choice rule by taking advantage of its strategic location on the national railway network and its role as the capital of Gansu province to bargain with MOR and CRLB(C2), so CRLB provided the land for the station (PO3). However, officials from MOR were dissatisfied with the limited willingness of provincial and local governments to cooperate and disappointed with their narrow vision (Interviewees 3,4). This had a negative effect on the cooperation between MOR(CR) and the Gansu provincial government on following HSR projects and the further development of the station area.

4.2.2. Function 2 Support Transfer Between Modes of Transport

This function aimed to provide passengers with seamless interchange between different transport methods. Actors had a challenge in cooperating under the conditions of fragmented institutional settings and land ownership. Railway actors were only responsible for railway services and the area inside the station building (P3; A1). Other local transport modes and facilities, including taxis, buses, metros and parking zones for private cars, were planned, provided, and managed by urban actors (P4; B3; A2).

The Lanzhou municipal government guided the transport and urban planning processes of the station area. It created a transport planning area of 8.17 km^2 to integrate the station area into the urban transport networks (see Figure 2). TJAD designed a multi-layer spatial system to achieve the seamless transfer of HSR, subway, bus, taxi and other transportation modes (see Figure 5) (I2). The spatial arrangement of the building, traffic flows and demand were considered carefully when the planners designed the routes for different transport methods (Interviewee 7).

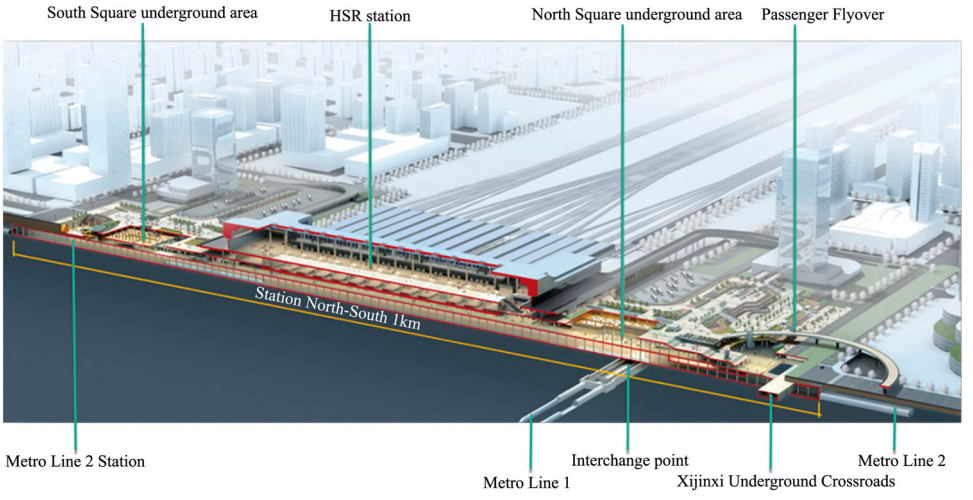

Figure 5. Section map of Lanzhou West HSR station area (Source: adapted from LRTC 2019).

Even though the railway engineers praised the design of transport integration (Interviewee 4), there were many problems in practice. The most serious problem was related to phasing. The HSR service started at the end of 2014, while the north square, bus stations, taxi zone and parking area were only opened in 2017. The subway began operating in the middle of 2019. In 2020, the south square and the east and west underpasses were still not used, because the relocation of factories had not been completed. Taxi drivers were unwilling to take passengers from the HSR station because of the traffic congestion around the station area. As a result, passengers arriving by HSR were unable to leave the station area by public transport for a length of time. LTB remedied this problem temporarily by requiring taxi drivers to convey passengers to and from the HSR station (A2). Although railway actors were aware of these problems, they did not have the resources to solve them (C1; A1) (Interviewee 2).

4.2.3. Function 3 Facilitate Commercial Development

Separate land ownership created difficulties for commercial functions (C1; A3; A4). It was divided into three parts, namely the retail and restaurant space on the second floor of the station, the retail and parking areas in the underground area, and the commercial buildings on the squares (S2). The retail and restaurants within the station belonged to the railway actor CRLB(A3). It aimed to provide convenience for passengers and the revenue was limited (Interviewee 5). The Lanzhou municipal government authorised the LRTC to construct and manage the commercial development in the underground area and squares while constructing the metro lines (Interviewee 6) (B3; A4). LRTC could obtain the rent revenue from the commercial area, parking and two high-rise commercial buildings (PO2). LRTC expected that the revenue from commercial development could compensate for the cost of construction and operation, but the goal proved difficult to achieve. Commercial development was hampered for various reasons (Interviewee 7). The following reasons were mentioned by the interviewees:

First, there was little negotiation on commercial development between railway actors and urban actors (Interviewee 6). Although CRLB proposed to develop the commercial area in the north square in 2014, it failed to obtain the development rights due to land transfer regulations, insufficiency of funds, and disagreements with the local government (Interviewee 3) (P4; B3; I3; A3; A4; C3; S3).

Second, the absence of market actors' opinions during the planning process also contributed to the difficulties of commercial development in the station area (B3; B4). Actors paid more attention to transport functions than to urban functions when planning the station area (Interviewee 6). The

area planned proved to be unsuitable for retail and unattractive to market actors, so the investment absorption and rent-seeking of the commercial area were problematic. Furthermore, the design of transport connections aimed to reduce the waiting time of passengers in the station area and ensure they could leave the station area quickly (Interviewee 7). Urban actors have ignored the fact that successful commercial development needs people to assemble in the area.

Third, standard approval procedures were required and many different choice rules were applicable because there were no specific choice and scope rules for the station area development (C3; S3). There was uncertainty and confusion regarding which rules to follow since some were designed for other situations and were contradictory. For example, the commercial functions of the station area were both limited by planning regulations and fire control regulations. The fire control standards were established in the 1970s and have not been updated. It was unclear which rules applied to the station area, especially in the underground area. Each department refused to take responsibility and instead delegated decision-making to other departments (Interviewee 6). The decision-making process was prolonged, and it took LRTC more than two years to obtain all the approved paperwork. The underground commercial area opened in 2019, which was five years later than the operation of HSR. The two commercial buildings on the squares have not been finished until 2021.

4.2.4. Function 4 Provide Public Space

The local government regarded the HSR station area as an opportunity to improve the city image, so it planned large public squares which served as waiting and interchange areas for passengers and also as public spaces for citizens (Interviewee 7) (P4; I2; S2). Together with the commercial area, the Lanzhou municipal government entrusted the LRTC with financing, construction and maintenance of these areas (B3; A6; PO2). The north square opened in October 2017 (see Figure 6). Many citizens criticised that the squares were too large for Lanzhou and their construction was a waste of money. On the contrary, urban actors argued that the number of tourists had increased by 30% since the opening of HSR, and that large squares were necessary for the future (Interviewee 6). However, there was no formal scope rule for square size and the boundary rules excluded citizens

Figure 6. Lanzhou West HSR station north square (Source: the authors).

from the planning process(B5). Furthermore, an underground interchange corridor is also a part of the public area, which connects the railway station, metro station, and north and south squares. It belonged to neither railway actors nor urban actors, so both CRLB and LRTC refused to manage this area (C1; A5; A6). After a lengthy negotiation, CRLB agreed to manage this area (Interviewee 5).

4.2.5. Function 5 Contribute to the Identity of the Surrounding Area

With the opening of the HSR station, there were some changes in the land use of the surrounding areas (S2). In the *2016 Detailed Control Plan of Lanzhou*, the area used for logistics and warehousing decreased by 0.183 km^2, while the area used for retail and business increased by 0.003 km^2. The Lanshi Group owned the area to the north of the station square, which was used for the Lanzhou Petrochemical Factory. To entice the Lanshi Group to relocate the factory to the Lanzhou New Area, the local government agreed that the Lanshi Group could keep the original site and pay only 15% of the land transfer fee for changing the land use type (Interviewee 9). Lanshi Group moved the factory and developed the area into residential areas, offices and shopping malls with a private real estate developer.

It is noteworthy that the land value of surrounding areas has increased sharply, but CRLB and LRTC have not profited from it. CRLB proposed cooperating with Lanshi Group to develop the surrounding areas, but there were no supportive regulations and institutions (B3; C1; A7; I3). Lanshi Group also did not cooperate with LRTC (P4; B3; A7). The LRTC constructed the flyover and underground passenger corridor which connected to the commercial building of Lanshi Group. It brought benefits for commercial development, but LRTC could not gain any revenue from it (Interviewee 6). Both CRLB and LRTC could not capture the land value increase of surrounding areas, which has become an institutional barrier to financing the construction and operation of the HSR station area. It urged the national and local governments to develop rules to encourage cooperation among these actors and to promote integrated transportation and land-use planning.

5. Discussion

5.1. Rules Obstructing the Integrated HSR Station Area Development and Operation

The Lanzhou case shows that the interaction of actors in each function was deeply influenced by rules. Various types of rules created barriers for actors' interaction and cooperation in developing the different functions, i.e. rules on position (P1; P3; P4), boundary (B2; B3), choice (C1; C3), aggregation (A1; A2; A3; A4; A5; A6; A7) and information (I3), and scope (S1; S2). These rules resulted in the separate development of transport and land use functions. In particular, aggregation rules revealed that the decisions in each function were mainly taken by one group of actors (Ostrom 2009).

Position, boundary and aggregation rules were sourced from laws and regulations such as *Railway Law*, *Land Management Law of China* and *Property Law*. They clearly define the responsibilities and physical boundaries in a station area between railway and urban actors. The national government allocates land for railway tracks and stations to railway actors. Local governments expropriate and govern other land parcels, such as the underground and the surrounding areas. Functions were decided upon and provided separately by railway actors and urban actors (see Figure 7). The most important function, function 1, which links the station area with the railway network, was decided by both railway and urban actors. Other functions were mainly decided upon and permitted by urban actors. Although CLRB and LRTC manage the station and station area together, they do not cross the physical boundary to manage functions.

Position, boundary and aggregation rules protect railway and urban actors' autonomy but hamper their cooperation. This is beneficial for the transport function's development, since the railway sector is technically complex and too many intervening external factors may decrease

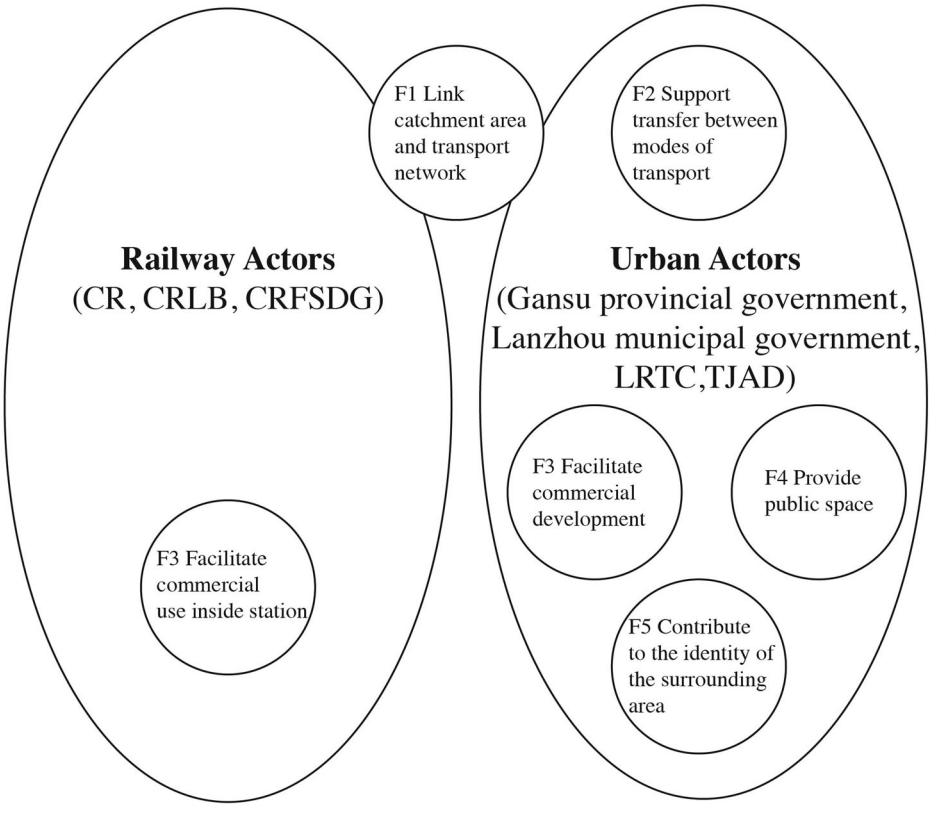

Figure 7. Responsibility for HSR station area functions of railway and urban actors (Source: the authors).

its efficiency (Tornberg 2012). However, these rules do create problems for urban functions, which require more cooperation between actors in the planning process. The institutional fragmentation of governance of urban functions boosts the chances of conflict in the planning process and creates enormous barriers to interaction (Klijn and Teisman 2003). Split land ownership not only creates challenges for collective action of actors, but also impedes the integrated development of transport and land use in the area. The Lanzhou case thus provides an explanation for the slow development of urban functions in Chinese HSR station areas in less economically developed regions.

5.2. The National Government Should Establish Specific Rules for HSR Station Areas

For the integrated development of transport and land use in HSR station areas, the national government published *Opinions of the General Office of the State Council on Executing Comprehensive Development of Land to Support Railway Construction* and *Opinions on Improving the Rational Development and Construction of the Areas Surrounding HSR Stations*. Both documents emphasised the need for integrated development of railway stations and station areas and the coordination between railway actors and local governments. However, these documents only provided general instructions and lack specific choice rules and scope rules for station area development $^{(C3;S3)}$. Some interviewees stated that interpreting these abstract principles into planning practice is difficult. The scope rule 3 stated that the planning outcomes depend on the local situation, which showed that a national-level design guideline for HSR station areas is absent. The Lanzhou West Station was the first HSR station in Gansu province, so urban actors could only learn from

other cities' experiences through visits and investigations (Interviewee 6). Ostrom (2009) argued that choice rules become ambiguous in a complex situation that is formed by a complex system of rules. Choice rule 3 stated that the HSR station area was regarded as a general urban area and urban actors did not clearly know which rules were applicable. The case showed that the complex situation and absence of a specific approval procedure for the HSR station area impede the development of urban functions.

Furthermore, the national government published *Opinions of the State Council on Reforming the Railway Investment and Financing System and Accelerating Railway Construction* and *Guiding Opinions of the State Council on Innovation in Investment and Financing Mechanisms in Key Fields to Encourage Social Investment*. Although both documents mention the need to attract market actors to invest in railway construction, a boundary rule for entry, a formal institution or an informal coalition between market investors and the government, are still missing. In the Lanzhou case, CRLB attempted to participate in the development of the station squares and surrounding areas. The absence of rules for land transfer, funding and revenue discouraged cooperation between railway actors, urban actors and market actors.

We recommend the national government develop specific boundary, choice and scope rules for HSR station areas to create a favourable policy context for coordinating railway and urban functions, for example, by publishing the planning guidelines. The spatial planning guidelines for the HSR station area could provide a framework for policy integration of different sectors by developing planning concepts (Stead and Meijers 2009). It helps actors to recognise that different land uses are parts of a shared spatial system from the beginning of the process (Neuman 2006, Curtis 2008, Bertolini 2012). To achieve sustainable development, it is crucial to integrate transport policy, environmental policy and land use planning between sectors and professions (Geerlings and Stead 2003).

5.3. Local Governments Could Modify Rules to Encourage Integrated Development of Transport and Land use

In line with Yang and Han (2020) and Wang *et al.* (2021), we found that the CR no longer had the paramount power to decide the location and development of a station, whereas the local government dominated a more decisive position. The current boundary rules contributed to the underperformance of the HSR station area because they limited different opinions from the public and market, the innovation of new solutions and institutional capacity [B4; B5]. The Lanzhou case showed that the opinions of market actors are crucial for commercial development. Considering the opinions of market actors during the planning process could bring benefits for attracting investments in the HSR station area. The local government can design boundary rules for market actors and the public to enter the planning process [B3].

Moreover, the interactions between actors were also hindered by information rules [I1; I2; I3]. Information rules should establish channels of information flow to connect all actors (Ostrom 2009). However, the decision-making process of China's regime relies on building a consensus among the top-leaders (Xu 2011). In the Lanzhou case, the communication between railway actors and urban actors relied on the interaction between CR and the provincial government because of the railway and provincial governments' high-level dialogue mechanism (*Ludi gaoceng huitan jizhi*). The information rules restrained the communication of actors, and actors usually did not have the overall information of all functions in the station area. On the contrary, during the decision-making process of the Wuhan HSR station, for example, the mayors of Wuhan visited the leader of CR in Beijing to express their demands directly(Yang and Han 2020). We suggest that local governments modify the information rules and improve communication with railway actors. Urban actors and railway actors could make decisions together for more functions and encourage integrated transport and land use development in the station area.

The local government can modify boundary, choice, aggregation and information rules for station area development by establishing a cooperative organisation for railway and urban actors.

The cooperative organisation, which consists of government departments and developers, can make decisions together and speed up the approval procedure, so that urban functions can be constructed alongside transport functions. It could also provide an opportunity for actors to capture the land value increase in the surrounding areas. For example, delegates from 23 Shanghai municipal departments founded a massive project planning agency, which was responsible for the spatial development of Hongqiao airport and HSR station area. The land development rights of Hongqiao hub were detached from segmented land ownership and a value capturing model was used to develop the station area as a whole and to provide funding for unprofitable development (Dai and de Vries 2018). The Lanzhou case showed that both railway actors and urban actors would like to be involved in the development of surrounding areas and capture the land value increase. However, the Lanzhou local government lacked the governance capacity to innovate rules to encourage integrated development, which is a key difference with the big cities where this innovation has been successful.

6. Conclusion

Although the integrated nature of HSR station area development has been of interest to policy making, there is limited knowledge of the institutional settings of their implementation. This research provides an in-depth understanding of the institutions which structure and constrain actors' interactions in the HSR station area development process. Literature mainly focuses on what functions a station area should have and which actors are responsible for certain functions (Bertolini and Spit 1998, Peek and Louw 2008, Zemp *et al.* 2011). This paper adds a comprehensive and detailed analysis of how the institutional rules influence the interactions of actors during the planning process towards integrated development of functions. Based on previous studies that have focused on HSR station areas in China's mega-cities, such as Shanghai and Wuhan (Dai and de Vries 2018, Yang and Han 2020), this paper extends the investigations to ordinary Chinese cities and explains why integrated transport and land use development were difficult in most Chinese HSR station areas.

This paper reveals that rules shape actors' interactions to a great extent and, therefore, influence the level of integration of transport and land use in the HSR station area. We found that the rules had a negative impact on the integrated development in Chinese station areas, especially on urban development, because the institutions provide no incentive for cross-sectoral and multi-level governance, and even discourage it. There was little interaction and communication between railway actors and urban actors in the decision-making process, which hindered the economically advantageous development of urban functions.

The national government has not established specific rules for integrated planning and development of HSR station areas. Due to a lack of such rules, the technical characteristics, funding, operation and management of different functions were decided and provided by different actors without cooperation. Furthermore, only railway actors and a few urban actors joined the planning process at an early stage, focusing mainly on transport functions. The lack of consideration of urban functions led to difficulties in the development process, especially with regard to commercial development. To achieve sustainable development, it is crucial to integrate transport policy, environmental policy and land use planning between sectors and professions (Geerlings and Stead 2003).

Thus, we advise the local governments to establish cooperative organisation in the short term, which could modify current rules to involve market actors and the public in the planning process of HSR station areas and encourage integrated transport and land use. In the long term, we suggest that the national government publish planning guidelines and new rules for integrated development in station areas, such as scope rules, boundary rules and choice roles. These rules can support the complex decision-making process by providing clear purposes, developing a common understanding of integration and functions, encouraging interaction and supporting trade-offs between diverse interests of actors.

Through applying the IAD framework, van Geet *et al.* (2019) have provided in-depth insights into the Dutch institutional contexts that impede transport and land use integration, so they have recommended applying the framework in different national conditions. This article underlines the usefulness of the IAD framework in the Chinese context, both in descriptive and prescriptive terms. It allowed us to conduct an in-depth analysis of the Lanzhou HSR station area planning and development, showing the institutional structures and mechanisms underlying the poor performance of HSR station areas. Since the lessons from Lanzhou could be applied to many cities in China, this paper provides a basis for restructuring future decision-making on HSR station area development, to safeguard the integrated planning of future station areas. Future research could employ this analytical framework to compare different cases in order to investigate the rules that improve the interactions of actors and the integrated transport and land use development, which could provide a basis for national planning guidelines in station areas. This framework could also be used to examine the institutional barriers to the integration of transport and land use in the metro station areas in Chinese cities. We also suggest that future research explores the institutional conditions of the integration of transport and land use by adopting this framework in other national contexts.

Note

1. The Lanzhou Urban-Rural Planning Bureau was merged with the Lanzhou Land and Resources Bureau, Lanzhou Development and Reform Commission, Water Resources Bureau, Agriculture Bureau, and Ecological Construction Bureau due to institutional reconstruction in 2019. The new consolidation is the Lanzhou Natural Resources Bureau.

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