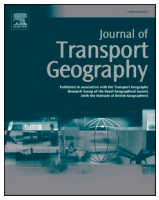
Journal of Transport Geography 115 (2024) 103816

Contents lists available at ScienceDirect

Journal of Transport Geography

journal homepage: www.elsevier.com/locate/jtrangeo



Socially sustainable transport in the context of different-sized cities in China:Conceptualisation and operationalisation of equity

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ARTICLE INFO

Keywords:
Transport equity
Social equity
Distributive principle
Accessibility
Mobility
China

ABSTRACT

China has witnessed a significant imbalance in socio-economic development across the country with its rapid urbanisation. As an important dimension of achieving sustainable transportation, increasing attention has been given to transport equity. However, most of the current urban transport equity research in China are empirical studies utilising definitions and measurements of equity largely originating from developed Western countries. Due to China's unique social institutions, conventions and development conditions, Western transport equity theories may not be fully applicable for guiding transport practices in China. This research, therefore, develops a conceptual framework of transport equity suitable for China's socio-economic conditions, grounded on a critical review of transport equity literature from both China and Western countries, and wider equity theories combined with literature on Chinese traditional culture and political institutions. A discourse analysis of transport planning and appraisal documents along with semi-structured interviews with Chinese transport practitioners are introduced to ensure the conceptual framework can be operationalised for guiding transport practices in different-sized Chinese cities. As well as identifying the range of benefits and burdens to be distributed, and clarifying which disadvantaged groups to focus on, we found the proper distributional principle for transport equity should be maximising the development prospects of disadvantaged groups, while for some cities with limited capability and resources, the principle of ensuring a baseline for every citizen to meet their basic needs is more practical.

1. Introduction

While much attention has been given to environmental and economic sustainability in China, research on social sustainability in transport systems remains inadequate. Transport equity is an essential theme within social sustainability in both developed and developing countries, particularly as transport equity and social equity are increasingly intertwined within the context of rapid urbanisation (Li et al., 2019).

Most of the current research on transport equity in the developing countries utilises definitions and measurements of equity that largely originate from, and have been established in, developed Western countries (Zhang and Zhao, 2021), which tend to be based on a rough review of Western equity theories. Existing literature fails to discuss whether these theories are suitable for China. Studies in China show that Chinese cities experience different levels and types of segregation compared to Western cities, which may result in a different understanding of the fair distribution of transport resources. For instance, Li and Liu (2016) found that though various hypotheses from the West have been applied in Chinese metropolises, little attention has been paid to the role of unique Chinese institutions, such as Hukou, which causes the emergence of invisible walls within cities. Cultural values may also affect equity theory (Bolino and Turnley, 2008) as people in collectivistic and individualistic cultures show obvious distinctions in their individual and group behaviours (Fadil et al., 2005). While many Western countries value individualism and capitalism, China tends to value deference and collectivism (Hatfield et al., 2011). Therefore, a discussion on transport equity theory in China based on its cultural background is necessary. Additionally, many terms are used in the literature on transport equity in China without distinction, among which the most common terms are justice, equity, and equality. As transport equity is widely applied in Chinese transport studies and policies, this paper initially adopts transport equity as a generic term (the differences between equity-relevant terms with regards to distributive principles, and which are more appropriate for China, will be explored in later sections).

An additional issue is that existing measures of transport equity have been predominately developed for and applied to metropolises. Smaller-sized Chinese cities demonstrate significant distinctions from

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https://doi.org/10.1016/j.jtrangeo.2024.103816
Received 15 July 2022; Received in revised form 2 January 2024; Accepted 4 February 2024
Available online 12 February 2024

metropolitan areas, which may limit the applicability of such measures. The local economy in many smaller cities is booming, whilst social development lags behind, in some cases economic growth is at the expense of social development. The conceptualisation of transport equity applicable to these cities may be affected by their socio-economic characteristics, transport systems, built environment, and other factors. For instance, Zhu et al. (2019) found cities with higher urbanisation rates have lower proportions of residents commuting by walking, which may be related to unfriendly walking environments. The proportion of commuters using motorcycles tends to be much lower in large cities, mainly because motorcycles are strictly forbidden in big cities due to the traffic problems they cause (Deng et al., 2009). Fan and Huang (2011) framework on transport affordability differentiates the focused groups based on their socio-demographics, the built environment, and the policy institutions. For these reasons, a context-sensitive framework for conceptualising equity is needed.

This paper aims to develop a notion of transport equity suitable for the unique socio-economic, cultural and political conditions in Chinese cities, grounded on a critical review of equity literature from both China and Western countries, an analysis of Chinese transport planning and appraisal documents, and semi-structured interviews with Chinese transport practitioners. Our goal is to help provide a culturally- and context-sensitive and practical definition of transport equity for Chinese transport practitioners. An initial conceptual framework is proposed based on a discussion of the relationship between transport equity and Chinese traditions and contemporary culture based on a critical review of the equity literature. This initial framework is then modified, drawing on an analysis of Chinese transport planning practices and local practitioners' views, to ensure the framework is acceptable and feasible.

The rest of this paper is laid out as follows: Section 2 briefly introduces the methodologies used. Sections 3–5 present our main findings. Section 6 discusses the results and develops a conceptual framework for examining transport equity in Chinese cities of different sizes. Section 7 presents our key conclusions.

2. Methodology

As mentioned in the introduction, this paper draws on evidence collected via three different approaches: a critical review of relevant published academic research, a document analysis of transport planning and appraisal reports from a selection of Chinese cities and provinces, and a series of semi-structured interviews with transport professionals working in China.

2.1. Critical review

Following Grant and Booth's (2009) clarification on different types of reviews, a critical review of Chinese and Western transport equity literature and wider equity theories was conducted. The review was based on the hypothesis that current Western transport equity theories do not capture the Chinese socio-political context, aimed at identifying the similarities and differences between the conceptualisation and application of transport equity within China and Western countries. The keywords used to identify relevant literature were selected to cover equity-relevant concepts, disadvantaged groups, and transportation issues. The keywords were used in combination to search bibliographic databases spanning the social sciences, humanities, engineering, urban planning and health disciplines, including Web of Science, Google Scholar, JSTOR, Scopus, ProQuest, CNKI (China National Knowledge Infrastructure), and Wanfang Data. Academic grey literature was accessed through university websites, conference proceedings, and relevant academic mailing lists. Additional articles were identified through searching co-authors and citations.

The papers were filtered and selected by relevance to the general topics of the review, source, date of publication, study location, target groups, research aims and type of study. Papers in both English and Chinese were included.

2.2. Document analysis

The analysis included online information collected from all 21 provinces, 5 autonomous regions, and 4 direct-controlled municipalities in mainland China, as well as national guidance from all departments involved in the transport planning process. Social appraisal of transport projects in China is divided among several departments. At the local level, the division of responsibility varies between cities, and can be complicated by the use of non-governmental agencies. For most cities, the Transportation Bureau or Municipal Transportation Commission, is responsible for organising the compilation of local transport plans and project reports (including feasibility and social risk assessment reports); the Development and Reform Commission is in charge of examining and approving these plans and documents; the Housing and Urban-rural Development Bureau is responsible for the quality and safety inspection of transport construction projects; the Ecology and Environmental Bureau is responsible for producing environmental impact assessment reports; and the Natural Resources and Planning Bureau takes charge of managing technical issues and land used for transport construction projects. Where limited documentation was available from a city government's website, as was the case for some smaller-sized cities, we also contacted a range of stakeholders and agencies to collect additional documents, including the Urban Planning and Design Institute and the Municipal Engineering Design and Research Institute.

Reports from at least one local transport plan, public transport and road construction project were selected from each provincial district for inclusion in the analysis. Where available, additional project types, such as cycling projects, were included (see Appendix B). The documents reviewed included transport plans and project appraisals, official guidelines, project publicity and news, and personal communications with public servants. Reviewed documents were published within the time frame from August 2017 to August 2023. For each city, the latest project for each project type was selected, and priority was given to projects with more relevant documents available.

A discourse approach was applied using discursive coding to extract contents (including indicators, introductory text, narrative descriptions, etc.) relevant to transport equality and distributive impacts, whether directly focusing on equity or indirectly by, for example, referring to distribution among different social groups. We paid attention to the primacy and emphasis (Alexander, 1988) within these documents to identify important aspects of transport equity in China.

2.3. Interviews with transport professionals

Interview participants included national and local public servants, transport consultants, and scholars with knowledge and experience relevant to transport social impact assessment (SIA). Sixteen transport practitioners from 13 different cities in China were interviewed (see Appendix C). By the 16th interview no new information was emerging; it was felt that saturation had been reached. According toMorgan et al.'s (2002) methodological study, the first 5 to 6 interviews produced the majority of new information in the dataset, little new information was gained after 20 interviews. Other researchers have found 6–17 qualitative interviews to be the common range for reaching saturation point (Namey et al., 2016; Francis et al., 2010; Guest et al., 2006).

Participants were identified using their job synopsis published online, or through referral from their colleagues, and were then recruited via email or other contact details provided by their referee. The participants were interviewed as part of a larger project on transport SIA. These interviews were conducted either in-person or through video calls via Microsoft Teams, and each interview lasted 30 to 60 min. The interviews were semi-structured and explored the following themes with participants: definitions of transport equity for Chinese cities, transport SIA practices with respect to equity, the contents of transport equality

impact assessments, and methods for improving local transport equity. Interviews were recorded, and later transcribed and analysed in Mandarin by Author 1.

An iterative deductive-inductive approach was used to analyse the interview data. The deductive coding used a set of priori category codes drawn from the critical review and document analysis. Starting with multiple readings of the interview transcripts, sections of text corresponding to the categories were highlighted and coded, then collated. The inductive approach started with open-minded readings of the collated coded texts to achieve an understanding going beyond the initial categorisation. Additional codes were applied to aid the identification and interpretation of similarities and differences in participants' views. One deductive-inductive iteration was conducted. The diversity of opinions was then compared referring to the practitioners' roles, city type, and other factors.

3. Critical review results

Many studies have agreed that definitions of equity contain three essential components (Behbahani et al., 2019; Martens et al., 2019; McDermott et al., 2013), which can be summarised as (1) impacts: the benefits and burdens that are being distributed, (2) target groups: the categories of populations the subject of distribution, and (3) distribution criterion: the standard or distributive principle applied to measure where a given distribution can be considered "morally proper." Each of these will be explored in turn.

3.1. Impacts that are being distributed

Currently, most of the existing research on inequality in urban China focuses on equity in terms of employment opportunities and living conditions (Wu et al., 2010; Wu, 2002; Wu, 2004; Logan et al., 2009). Studies on equity in general have discussed the unequal level of individual socioeconomic achievements, the provision of amenities primarily between different regions (Zhang and Kanbur, 2005), and income disparities among different social groups (Fan, 2002). Indeed, most of the literature on inequality in China is about income inequality (Xie and Zhou, 2014; Sicular et al., 2007; Démurger et al., 2006;Aaberge and Li, 2005; Yang, 1999). China's transition to a market economy has transformed a society once characterised by egalitarianism into one that is experiencing an increasing income gap (Sicular et al., 2007). Since the reforms in 1978, China has experienced unprecedented economic growth, leading to spectacular reductions in income poverty (Fan et al., 2002; World Bank, 2001). However, this growth has been accompanied by increasing inequality. Growing disparities along different dimensions (urban-rural, inland-coastal, etc.) have attracted increasing attention. Zhang and Kanbur (2005) criticised studies in China for presenting relatively little analysis on inequalities in other dimensions of human development. Xiao et al. (2017) argued that the core concern internationally, from an environmental justice perspective, is the spatial distribution of public goods and services, but highlighted that there is little empirical evidence of this concern in China.

Within the transport domain, the benefits and burdens considered for distribution include mobility itself, access the transport system provides, and actual activity outcomes (Martens et al., 2019). Martens et al. (2019) distinguished four key aspects of transport-related equity: (1) mobility/accessibility, (2) traffic-related pollution, (3) traffic safety, and (4) health. Transport-related exclusion and transport poverty are concepts widely recognised in Western transport studies (Church et al., 2000; Kenyon et al., 2003; Lucas, 2011, 2012). The former states that certain groups are excluded from the economic, political, and social activities of the community due to their limited accessibility to jobs and social activities (Kenyon et al., 2003); whereas the latter specifically concerns the inaccessibility caused by a lack of affordability and capability to select certain travel modes (Litman, 2015; Mattioli et al., 2017). For transport equity in China, Zhang and Zhao (2021) found, from a systematic review, that the focus has changed over time. They identified three major themes arising in Chinese equity-relevant transportation research since the 2000s – (1) accessibility to jobs and urban services; (2) socio-spatial variances in mobility activities; and (3) subjective satisfaction and wellbeing. They note, there was limited transportation literature discussing the benefits and burdens that are being distributed from the perspective of Chinese culture and ideology.

Internationally, many scholars define transport equity through exploring how transport accessibility is distributed among social groups (Van Wee and Roeser, 2013; Van Wee, 2012; Martens, 2012). Pereira et al. (2017) argued, through an ethical perspective that builds a dialogue between egalitarianism and the capability approaches, accessibility is a combined capability which emphasises the social and economic opportunities available for individuals to access if they are willing. Thus, accessibility should be the primary focus of transport researchers and policy-makers addressing questions over distributive justice and transport disadvantage. In this vein, Martens (2012) considered transport equity as the moral justification of a distribution principle in accessibility to opportunities. Many scholars agree that transport equity is not about distributing transport infrastructure and investment, but about distributing the capability to travel to jobs and to participate in other social activities that are essential for survival and personal development (e.g., Di Ciommo et al., 2019; Pereira et al., 2017; Beyazit, 2011). Similarly, in much of the research on transport equity in China, scholars use the distribution of accessibility to various destinations to represent transport (in)equity (e.g. Sun and Zacharias, 2020; Sun et al., 2018; Yang et al., 2018; Xing et al., 2018; Zhou et al., 2018a).

While many studies have focused on accessibility to jobs and key urban services, Wang and Zhou (2017) found relatively few Chinese scholars looked at accessibility to daily life facilities, despite decisions made for daily activities being closely linked to a full understanding of transport benefits (Spinney et al., 2009). Wang and Zhou (2017) deemed that more attention needs to be paid to the influence of Chinese culture on access to basic needs, such as the strong family relationships and the obsession with food freshness. For example, Wang and Lin (2014) argued Chinese's obsession with food freshness leads to an emphasis on accessibility to food markets or shops for daily goods.

Though mobility is considered an important aspect of transport equity (Di Ciommo and Shiftan, 2017), most Chinese studies have merely discussed mobility through the studies on how the built environment influences travel behaviour (e.g. Zhao and Yu, 2020; Ao et al., 2019; Wang et al., 2011), few studies have focused on mobility from a transport equity perspective. Western scholars have argued that a greater emphasis is needed on mobility metrics to achieve mobility justice across population groups (Sheller, 2019; Martens and Di Ciommo, 2017; Lucas, 2012; Martens, 2012; Geurs and Van Wee, 2004). Cao and Hickman (2019) found Chinese studies often overlook the underlying reasons for travel and mobility barriers, which include individuals' capabilities and functioning, as well as structural constraints, such as the political and cultural context affecting travel in different jurisdictions.

Many Western studies have paid attention to the environmental impacts of transport policies on vulnerable groups, such as security, air pollutions, and noise (Chakraborty, 2006; Brainard et al., 2004; Morello-Frosch et al., 2001). Traffic-related pollution is often identified as a key dimension of transport equity, however, though a few studies in China (e.g. Ma et al., 2021) have shown that different social groups sustain an unequal burden of air pollution and noise during daily travel, research exploring how these impacts are distributed among different social groups in China remains scarce. Even fewer scholars have explored the distributional impacts of mobility on other aspects of the environment, even though, within Chinese culture, harmony between human beings and the environment is imperative (Yang, 2012).

As an important concept in Chinese culture, harmony is not only about pursuing a balance between people and the environment, it is also about the connections among people in a community or society (Yang, 2012). Again, few scholars have explored the distributional impacts of

mobility on social networks. From the social network perspective, socialist countries have displayed a high level of collectivism (Peng and Heath, 1996). Yan (2010) argued that individuals in China need to take more responsibility and proactive actions for the sake of enhancing the wealth and power of the nation-state, namely the "modernisation" of the country. Accordingly, transport equity in China may need to focus more on resources and opportunities for people to contribute to community and national development, i.e. access to social networking and the indirect impact of access to jobs and education on collective endeavour, and place less emphasis on freedom to achieve individual development when it conflicts with collective interests. In this sense, key impacts of transport equity in the Chinese context refer to how people participate in society via transport networks, which can be linked to the important concepts in the Western literature, such as social inclusion, segregation and severance. For instance, Musselwhite and Haddad (2010) research on the mobility of older people in the UK revealed that travel can reduce social isolation and increase social interaction, which helps to establish strong social networks to enable mutual practical, emotional and physical support.

Recently, increasing attention has been given to how transport influences quality of life through analysing impacts on travel distance, time, cost, comfortability of daily mobility and living amenity. This may also be related to Chinese traditional social culture. Inoguchi and Shin (2009) argued that Confucian societies treasure subjective well-being over physical welfare. Shu and Zhu (2009) discovered high levels of satisfaction with interpersonal, material, and nonmaterial life domains, positive assessments of relative living standards, and high rates of marriage have direct positive influences on Chinese subjective well-being. Ye and Titheridge (2017) research in China indicated that subjective wellbeing is closely linked to travel satisfaction. Scholars also found that there remain inequities in both travel satisfaction and subjective wellbeing in China (see for example, Ye and Titheridge, 2019; Zhu and Fan, 2018).

3.2. Identifying social groups for transport equity

Equity scaled by demographic characteristics (i.e. age, ethnicity, gender, education, income, culture, disability, etc.) has long been applied within Western transportation research (Dixit and Sivakumar, 2020; Martens et al., 2019; Litman, 2015). While studies on transport equity in China tend to use similar population categories (Zhao and Yu, 2020; Cao and Hickman, 2019; Li et al., 2019; Cao et al., 2018), Zhang and Zhao (2021) found, in their review of urban transport equity literature, limited publications on the relationship between mobility and women, ethnic minority groups, disabled or older people in China. They also found little Chinese literature mentioning the distributional impacts of transportation related to religion or sexuality.

From the perspective of contemporary governance, numerous scholars have suggested that the key social groups to be considered when addressing transport equity in China are different from Western countries, due to China's distinct institutional structure (Zhang and Zhao, 2021; Tan et al., 2019; Xiao et al., 2017; Wu et al., 2010). The Chinese Hukou system is a regime for population management and social welfare distribution, characterised by an urban-rural dichotomy. The Chinese Hukou system is a key obstacle preventing rural migrants improving their life. Those born in rural areas have a rural Hukou. Urban residents with a rural Hukou are prevented from accessing the urban welfare system (Chan, 2009) and the housing market (Logan et al., 2009). Rural migrants are also much more likely to be working in dangerous jobs, with lower salary, compared to native residents (Solinger, 2006). For these reasons, Xiao et al. (2017) identified rural migrants as one of two vulnerable groups considered to be the new urban poor (the other being laid-off workers). In contrast, a few studies (e.g. Li and Liu, 2016) have found that non-Hukou migrants have a better job-housing balance compared to local residents. Zhang (2002) criticised that under the Hukou regime of citizenship, the Chinese government often sought to achieve social equity within either urban or rural realms, not between them. It is worth noting, however, with deepening privatisation and commercialisation, access to urban resources no longer neatly correlates with Hukou status (Zhang, 2002). With the effort to transfer capital from the production sector to the built environment in the ongoing socioeconomic transition (Wu, 2019), China is witnessing a nationwide suburbanisation of the population in general (Zhang et al., 2021), particularly in relation to the motorisation of less developed inland cities (Zhang and Zhao, 2021). The impact of the Hukou system on transport disadvantage may now be more prominent in these types of cities than for large cities. This has resulted in an increasing interest in research on transport equity in inland, smaller cities (Tan et al., 2019) and in multi-ethnic rural areas (Tan et al., 2019; Zhao and Bai, 2019).

Another institutional factor which profoundly influences transport equity in China is the housing system. Danwei, as a typical Chinese housing quarter, is the common name for state or collective-owned institutions or enterprises in Socialist China (Bray, 2005). Danwei is assigned to workers as a self-contained work unit, using a top-down system to allocate all essential services including housing, healthcare and education (Zhang et al., 2018). Wang and Chai (2009) compared commuting behaviours of individuals living in Danwei housing with those living in houses bought or rented from the market, and found inequalities in travel mode, time and frequency.

Old Danwei communities and non-Hukou residents are just two of the key disadvantaged social groups that have been identified in the literature, based on the institutional settings of housing and jobs in China. Others include under-privileged neighbourhoods (Zhang and Zhao, 2021), urban villages (Chen and Yeh, 2019; Yu et al., 2019), affordable housing communities far from the city centre and displaced residents' resettlement housing (Zhang et al., 2021). Disadvantaged groups in terms of access to employment and education, include migrant workers with rural-Hukou (Li and Zhao, 2017; Qi et al., 2018), skilled young migrants (Zhang et al., 2018), the working poor (Qi et al., 2018; Zhao, 2015), and left-behind children (Li and Zhao, 2015). This suggests a necessity to identify social groups based on China's specific institutional structure when discussing transport equity.

From the perspective of traditional culture and philosophy, transport equity studies in China need to pay greater attention to measuring equity in accessibility by household unit compared to Western research which tends to focus on either areas or individuals. The capitalism of Western countries tends to be characterised by individualism, hence the research focuses on the capabilities and resources of individuals (e.g., Lucas, 2012; Kwan and Schwanen, 2009; Urry, 2007). Historically, the constitution of China's cultural environment may be characterised by the use of Confucianism. From a social value perspective, the principles and rules of Confucianism regulate the behaviour of individuals, the family, and the community, and emphasise family and community over the individual (Kang and Chang, 2016). Family is posited as the fundamental unit of society, incorporating the economic functions of production and consumption as well as the social functions of education and socialisation, guided by moral and ethical principles (Park and Cho, 1995). Family and society are considered to be hierarchically ordered and relationships among family members are not based on equality or rationality as it tends to be in the West, but on Human-heartedness (articulating the interpersonal and altruistic virtue) and Rightness (referring to the set of roles and status of an individual in both family and society) (Kim and Park, 2000). Therefore, when exploring transport equity, Chinese scholars stress the importance of identifying different types of family or household (Wang and Zhou, 2017; Yang et al., 2018; Feng et al., 2013). For instance, Wang and Zhou (2017) indicated that extended family households in China, i.e. multiple generations living together in the same household, have significant implications for residential choice, family members' daily time allocation and travel behaviour. This suggests it is important to distinguish between different household types to understand transport equity in China.

3.3. Distributive principle for transport equity

Since equity-relevant transportation studies in China are criticised for their common shortfalls of ambiguous definitions and lack of distinction between relevant concepts (Zhang and Zhao, 2021), this section starts with a discussion on the differences between transport equity, justice, and equality, in order to identify which is more appropriate to be applied to China and Chinese small- to medium-sized cities.

Many Western transportation scholars have attempted to clarify the conceptual difference between transportation justice and transportation equity from the perspective of contemporary governance (Karner et al., 2020; Vanoutrive and Cooper, 2019; Pereira et al., 2017; Martens, 2016). For instance, Karner et al. (2020) deemed that studies on transportation equity rely on a state-sponsored approach, stressing the role of government in achieving equitable distribution through expert-based scientific evaluation and simulation. Conversely, transportation justice is more common among activist groups and non-governmental organisations, and stresses the role of bottom-up forces in eliminating top-down distributive unfairness through multilateral negotiations and public participation. Since the Chinese government plays a much more dominant role in society compared to Western countries (Yee, 2009), especially for transportation infrastructure projects, the concept of transportation equity is more suitable for China than transportation justice (Zhang and Zhao, 2021).

To clarify the differences between equity and equality, it is helpful to start with a discussion of the ideal destination for human beings or the vision for society embedded in traditional Chinese philosophy. Yang (2012) discussed the differences between ideal destinations in the Western world and in China. While a key feature of capitalistic ideology is generally the principle that individual effort is rewarded and benefits the individual, socialist ideology tends to consider harmony among human beings and nature as the ultimate goal; this is seen as more important than an individual's rights or growth (Steele and Lynch, 2013). In this way, Western culture and capitalism may seek fully developed human potential with an active individualistic approach, whereas Confucianism may apply a collective approach and a predetermined hierarchy with assumed roles. Though scholars often argue that the equality rule is preferred for a society in which the members are more collectivist and cooperative in orientation (Wagstaff, 1994; Hui et al., 1991), Confucianism does not seek absolute equality among individuals in terms of social roles and positions but accepts a certain level of inequality derived from individuals' different achievements in self-cultivation (Yang, 2021).

From a Chinese political perspective, on the one hand, the ideal destination of socialism is communism, where human beings are supposed to act, as Marx (1875) famous principle states, “from each according to his ability, to each according to his needs”. Consequently, socialism views equity as more important than equality (Nevis, 1983). In this way, the Chinese Communist “party line” stresses the equity rule (Giacobbe-Miller et al., 1997). On the other hand, the “socialist market economy”, which may seem to be a peculiarly Chinese Marxist notion and epitomises “Socialism with Chinese characteristics” (Sigley, 2006), indicates a significant role for markets, recognising that this involves “a sacrifice of some degree of equality” (Weisskopf, 2015, p.33).

Zhou et al. (2018a, 2018b) study on education in China revealed that Chinese official discourses have established sets of corresponding language to convey the state's concern on different aspects of equality. For instance, Pingdeng (equivalent to equality) refers to the sameness in the distribution of resources, such as equal rights to access and equal opportunities, whereas Gongping (equivalent to equity) refers to fairness and justice in the distribution. They further indicated that the official discourse of ‘equity’ can be considered as a concept equivalent to that of justice or fairness at an individual level, which is the state's ultimate goal for the future. ‘Equality’ however, is preferred when the state articulates the concrete and operational goals to be achieved in the present, despite these two often being used interchangeably. The official discourse of equality is largely limited to the dimension of opportunity, such as equality in access, resource and achievements, and eliminating social and system barriers. Since the government admitted that inequality is an unavoidable reality due to the existence of complex and intractable social conditions, such as the country's tremendous size and population, China aims to achieve Junheng (i.e. development, but regionally unbalanced) first, equality next, and equity last (State Council, 2012). Similarly, ‘equity’ is applied to describe the general goal of transport development in the official documents (see for example, State Council, 2020). Therefore, whether transport equity or equality should be used in China depends on the specific context of the application; equity is considered to be the appropriate term when discussing transport development goals in general.

Having discussed whether equity, equality or justice is the most appropriate terminology to use, we then explore what “morally proper” means in the Chinese context. Martens et al. (2012) justified their distributive approach to transport by illustrating the importance of institutions in equitable distribution and introducing Walzer's (1983) “Spheres of Justice” to the transport sector. Martens (2016) argued that external intervention in the transport sector is necessary to achieve equitable distribution of person-based accessibility. Inequality in accessibility is inevitable, thus transport equity is neither about disclosing the inequalities in mobility nor about ensuring homogeneity in every aspect of mobility. Instead, it is about appropriate state (or institution) intervention in the transport sector to reduce the disadvantages of the bottom of society in access to opportunities (Martens, 2012). The version of socialism practiced by the Chinese Government was established on a class basis, in which the overall managerial strategy was based on a central planning system and low-level managers had little or no decision-making power (Yang, 2012). This underlines the perceived power and duty of the Chinese government to conduct top-down transport interventions to achieve the socialist goal of “common prosperity” through enabling more people and more regions share the benefits of economic development and addressing inequality by enabling disadvantaged groups and less developed regions to benefit from economic growth (Fan, 2006).

Both Rawls (1999) egalitarianism and Sen (1979) capability approaches stress the inherent differences between individuals according to ethnicity, gender, capability, and household background. These inherent differences lead to inequalities in opportunity and capability of getting access to participate in social activities that are essential for individual survival and development (Sen, 2005). Therefore, an equitable distribution is one which helps individuals with different backgrounds to acquire opportunities equally (Rawls, 1999; Sen, 1979). Based on this, Western literature tends to define transport equity as how the distribution of transport services helps to achieve equality of opportunities or life chances (Pereira et al., 2017; Taylor, 2010). Two distinct principles of equitable distribution of accessibility have been developed from the theories of Rawls (1999) and Sen (2005). Rawls's egalitarianism (Rawls, 1999) stressed a maximum criterion that the equitable distribution requires a maximisation of the prospects of the least advantaged groups, subject to constraints. Based on Sen (1979) capability approach, Nussbaum (2011) noted that a distribution is equitable if it ensures that everyone has the minimum level required to meet their basic needs. Martens (2012) combined these two principles, suggesting an intervention can be considered equitable if it either maximises the minimum level of accessibility for the least advantaged people or increases accessibility of the least advantaged to reach a threshold.

When it comes to defining a distributional principle for China, it is important to consider both traditional social values and contemporary government thinking. With regards to traditional philosophies, Benevolence (Ren) is a core idea and social norm of Confucianism, which as a governing principle calls upon state leaders to empathise with and care for their peoples (Yan, 2018). This can find application in the relationships between the strong and the weak, the rich and the poor, and those

occupying high and low ranks at work, helping to reduce social conflicts between the advantaged and the disadvantaged. Yan (2018) raised the example of 'first come, first served' as a distributive principle, this is not always fair to the aged or weak in cases such as getting a seat on a bus. Benevolence, however, eliminates this conflict by requiring stronger people, whether or not among the first in line, to yield their seats to those in greater need of one. This point of view has had a profound influence on the Chinese ideology of 'respect the aged, cherish the youth, support the weak, help the disabled', which is still a moral rule in contemporary Chinese society (Zhang and Rosen, 2018). This is also in line with a key concern of socialism, which aims to remove the gap between the rich and the poor (Behbahani et al., 2019). Similarly, the Chinese Government's Five-year Plan focuses on benefiting particular disadvantaged groups and regions (Fan, 2006). To this end, egalitarianism is more suitable than the capability approach for guiding transport equity in China since it advocates maximising wellbeing for disadvantaged groups and narrowing the gap between different groups of population.

Based on the critical literature review presented above, an initial conceptual framework for defining and measuring transport equity can be summarised as shown in Fig.1, drawing on both the contemporary political culture and Chinese traditional culture and philosophy. How transport equity in China needs to be addressed differently from Western developed countries are mainly reflected in (1) impacts: a need to give a greater emphasis on culture-related activities and social networks; (2) target groups: a need to consider the family or household as a unit; and (3) distributive principles: the need to apply an egalitarianism instead of a capability approach as the general guiding principle.

The results from the document review and interviews with Chinese transport planners, conducted to understand the application of transport equity in the current practices and presented below, were then used to check and if necessary moderate the framework to ensure it is practicable and acceptable for transport practitioners.

4. Document analysis

In general, the transport policy and appraisal documents reviewed failed to provide a clear definition of transport equity and there was limited analysis of how different social groups would be affected by a proposed transport intervention. Discussions on transport equity mostly appeared in appraisals for large-scale projects, such as smart public transport systems, highway construction, and rail transit projects. How the appraisal and policy documents reviewed treat each of the main transport equity components (see Section 3) is reported below.

4.1. Impacts

Most of the documents merely include a general description of the equity impacts, with only a few planning and appraisal reports applying indicator sets to measure the impact of the proposed projects on equity. From the aspect of equity dimensions, transport appraisal documents in China placed much attention on economic equity impacts, while social and environmental equity received less emphasis. Most of the documents discussed the effect of transport interventions on local employment, and the allocation of project benefits, particularly accessibility. Most of the reviewed reports only explored the impacts on quality of life in relation to land expropriation. Some of the documents also discussed equity issues in relation to public participation.

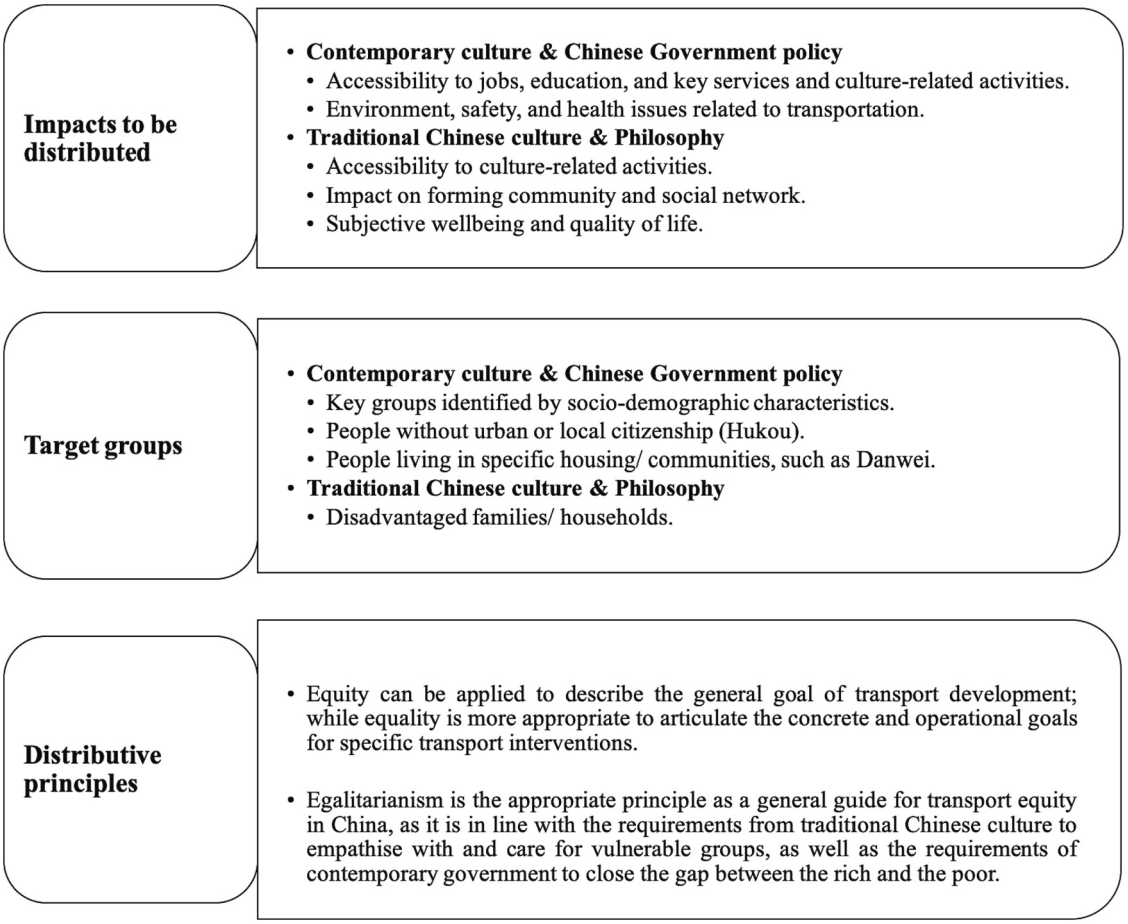

Fig. 1. Initial conceptual framework for transport equity in China.

4.2. Target groups

When assessing how different social groups are affected by transport plans or projects, the reviewed documents generally covered five categories: senior citizens, people with disabilities, women, people with low-incomes, and residents living in different areas. It is worth noting that not all five groups are included in every appraisal document. For smaller-scale projects, such as bus service changes, only people in poverty and local residents were mentioned. The key groups identified, through the critical review, to be considered specifically for China were missing from most of reviewed documents, except for some megacities, for instance, plans and appraisal documents for a public transport service for residents in newly-built commercial communities in Shanghai.

4.3. Distribution principles

From the perspective of transport equity principles, many reviewed projects from small- to medium-sized cities, such as new roads or bus routes, aimed at ensuring a minimum level of accessibility for people who live in areas with limited transport resources to meet their basic needs. Another aspect stressed in these cities was to mitigate negative impacts of proposed transport interventions on the quality of life of groups. This is often applied to the case of providing compensation for project-related land acquisition and household relocation. For instance, each city stated it is necessary to ensure proper placement of relocated households, and has established compensation standards for land acquisition.

For a few large-scale projects in developed cities, a different principle was applied which stresses improving the accessibility and capabilities of vulnerable groups. For example, the social impact assessment report for a smart transport project in Liaoning province stressed that disadvantaged groups, such as women and those living in poverty, should be prioritised for employment opportunities created by the project. To improve accessibility, affordability, journey quality, and participation levels, this project included a series of actions, such as providing free public transport services to older and people with disabilities, collecting opinions from vulnerable groups via a special channel; incorporating priority seats and other facilities for women, older people and people with disabilities, etc. This was to ensure that disadvantage groups are able to enjoy the benefits of the project equally with other social groups, thereby maximise the additional opportunities they can get from the project.

5. Interview results

All the interviewees clearly thought that equity was something that they ought to consider, although most of them suggested that equity is by no means the most significant consideration in policy formation and scheme selection. Most of them agreed that they do not fully understand what should be included when defining transport equity. Though every participant mentioned a few aspects of transport equity, most of participants failed to give a systematic definition of it. Interviewees from government and consultancies indicated that most of their colleagues are from an engineering background and have little knowledge of social science. Therefore, in many cases, equity was merely mentioned as a general goal, with no supporting explanation, targets, or indicators.

5.1. Impacts

Different interviewees presented different transport equity priorities. Though all respondents stressed the importance of analysing the distribution of accessibility, some scholars interviewed argued that current accessibility tools are not well combined with equity assessment. P2 considered accessibility to be largely assessed through "*modelling the connectivity of transport networks, without considering people's travel preferences*". Most public servants emphasised the distribution of land-use and inequities in regional development, while all the consultants talked about equity in the type of compensation for land acquisition, which is a major point when they conduct SIA for the local transport department. All the participants from academia considered providing different levels of resources to achieve equal accessibility for different groups of people is essential for improving transport equity. Half of the scholars mentioned that the distribution of travel convenience and comfortability are also important when addressing transport equity.

Public participation, as another essential part of transport appraisal, was mentioned by all the interviewees. It is closely related to transport equity as a channel to understand the differences in requirements and capabilities of various groups. Around half of the interviewees from transport consultancies felt that transport planning faces low levels of community participation, especially from vulnerable groups, due to a lack of interest and established channels for engagement. Therefore, channels of engagement which are more friendly to disadvantaged people, such as the older generation, are needed to improve transport equity at the local level.

5.2. Target groups

Many of the interviewees from medium-sized cities felt there was a lack of clarity about which vulnerable groups should be considered, thus certain groups might have been neglected. P7 stated that disadvantaged groups "*such as the aged, the disabled and low-income groups*" have been considered in many of the transport planning works that he conducted, however, other disadvantaged groups were rarely covered. In addition to the five categories summarised from the document analysis, participants also identified people with no local or urban Hukou, and people who live in specific kinds of communities, such as resettlement housing and urban villages. For example, P3 suggested that "*households who are having to relocate as their current home is being demolished to make way for the transport planning and migrant workers without local citizenship*" are key groups to be considered in transport planning, but they may be neglected because "*there is no clear statement regarding these social groups in the national guidance*".

5.3. Distribution principles

Although all the transport scholars admitted that the current definition of equity applied in Chinese practices is based on Western theories, they agreed that the principle of equity in China needs to be considered differently from Western countries. Most of the interviewees from academia and a few public servants raised the idea of harmony, which includes the balance between humans and nature, and the amicable relationships among people. They considered that to achieve harmony within society, it is important to bridge the gap between the rich and the poor, therefore equity should be understood as maximising the welfare of vulnerable groups. As P5 mentioned, "*harmony is a key guiding ideology of equity in China, which aims to narrow the gaps and reduce the contradictions among different groups and areas*". P13 argued that "*the most essential concern* [of transportation] *is disadvantaged groups*". However, most of the consultants and public servants deemed that it is more practical to pursue transport equity through ensuring that everyone has been provided with the opportunities and resources to meet their basic needs. P15 pointed out that this does not mean it is not important to eliminate the gap between different social groups. In fact, this should be considered as "*a final goal*" (P15). However, under the current socio-economic development conditions of smaller cities in China, achieving a baseline level for every citizen is more feasible in the interim.

6. Discussion

Table 1 presents a comparison of the main findings from the critical review, document analysis, and interview analysis. Three dimensions of

Table 1
Comparison of transport equity in the literature review, document review and interview.

Component of transport equity	Western literature	Chinese literature	Chinese transport documents	Interview
Benefits and burdens that are being distributed	1. Accessibility 2. Mobility 3. Transport-related environment, safety, and health issues	1. Accessibility (including accessibility to social activities and culture-related issues) 2. Mobility justice related to individual's capability and structural constrains 3. Impact on environment and forming liveable community and social network 4. Subjective wellbeing	1. Job creation and accessibility to employment and key services 2. Affordability of public transport services 3. Property price 4. Land acquisition and resettlement	1. Accessibility 2. Convenience and comfortability 3. Land-use 4. Regional economic development 5. Public participation
Social groups	A wide range of socio-demographical characteristics, including race/ethnicity, religion and sexuality	1. A wide range of socio-demographical characteristics, excluding race/ethnicity, religion and sexuality 2. Citizenship 3. Housing structure 4. Family and household	1. Older people 2. People with disabilities 3. Females 4. Poverty group 5. Residents in different affected districts	1. As per the document review 2. People without local or urban Hukou 3. Residents living in specific types of community
Distributive principle	1. Mixed application of the terms of equity, equality, and justice 2. Necessity of policy/institution interventions 3. Achieving equal distribution of opportunity and freedom for individuals to meet their basic needs 4. Combination of egalitarianism theory and capability approach	1. Equity, rather than equality or justice 2. Emphasis on top-down interventions 3. Egalitarianism-dominant principles	1. Enable local people with limited transport resources to meet their basic needs, mitigate negative impacts of the proposed project on sensitive groups 2. Enable disadvantaged groups to have equal access to and get equal benefits from the proposed project 3. Maximise the development prospects of the disadvantaged groups	1. Maximising welfare increases for the vulnerable groups 2. Establish a baseline for every citizen to meet their basic needs

Source: summarised by the authors.

transport equity, including impacts, target groups, and distributional principles, are considered for each approach. As Martens et al. (2019) has pointed out, presenting a coherent consideration that addresses all three dimensions and their interrelationships is a prerequisite for operationalising equity, which will help to achieve a fairer redistribution of a given resource, and/or to protect vulnerable people from an identified burden. In this way, we can break down the concept of transport equity and combine it with various characteristics and requirements of China's specific social norms and political institutions. Since transport equity had not been not clearly defined or established with systematic measurement in Chinese transport practices, the three dimensions was also helpful to identify separate equity-related issues from transport documents, and to capture and categorise key information from the interviews when the participants are not able to structure a clear picture of how they understand transport equity. Thus these three dimensions will be incorporated in our conceptual framework of transport equity in China.

In terms of the benefits and burdens to be distributed, all three analyses, pointed to accessibility to economic and social resources as the most important of the benefits to be appraised in transport equity assessments. In addition to accessibility to key services and facilities to meet people's basic needs, as commonly included in Western studies, Chinese traditional values suggest it is important to include accessibility to social networks. Moreover, the literature suggests that, in Chinese culture, accessibility to key services related to people's specific preferences and living habits need to be considered.

Another key set of benefits and burdens mentioned in Western studies are the distribution of transport-related environment, safety, and health impacts. Though these topics are widely discussed in Chinese research and practice, limited cases have focused on their connection with equity. Chinese literature does, however, stress the impacts of transportation on the built environment, and the contribution of transport in building inclusive and liveable communities, and enhancing social networks, thereby influencing subjective wellbeing. This suggests Western measures of transport equity relating to environmental and health impacts need to be adjusted to reflect Chinese concerns around community, social networks and well-being.

Within transport practices, impacts on economic equity are stressed, revolving around job creation, public transport affordability, property prices, land-use allocations, and regional economic development. Current transport practices do include a few aspects of social equity: differential levels of public participation decision making, changes in living conditions related to housing demolition and community relocation, and the convenience and comfortability of travel. In short, transport equity assessment in China needs to include a wider range benefits and burdens than tend to be covered in the Western literature or are currently included in Chinese practice.

In terms of the target groups, a general differentiation based on socio-demographical characteristics is needed. Key groups include the older generation, people with disabilities, females and those in poverty. Based on the Chinese studies and practices, differentiation by housing types and citizenship should also be considered when discussing transport equity because of China's specific political institutions. Traditional Chinese social values indicate the necessity to define transport equity not only based on types of individuals, but also types of families or households. It is worth noting that though limited research in China explores transport equity among groups with different races, religions, and sexualities, it does not mean that these minority groups can be ignored in China. Many Western scholars have found that people may experience transport inequities related to their race or sexuality, such as discrimination, abuse, and poor accessibility (Ge et al., 2016; Levy, 2013; Clifton and Lucas, 2004). Similar issues may also arise in China. For example, Lan (2016) found that African migrants in Guangzhou, a mega-city in South China, have experienced additional challenges and unfairness. Cao (2010) found minority populations in Xinjiang experience poor levels of accessibility due to a lack of infrastructure. Therefore, future research on social groups divided by these characters is needed to fully understand transport equity in China.

With regards to the distributive principles to be used for China, Chinese traditional values and the political system place greater emphasis on the power and duty of government to intervene, i.e. transport interventions tend to be top-down. However, through the

document review and the interviews, it was seen that increased public participation is also important for addressing transport equity in China. Chinese government needs to improve public awareness and address private concerns about transport-relevant equity issues, and provide more political space for public participation in decision making. This could be achieved, for example, and adapted from Zhang et al. (2019) suggestions on improving public participation on environmental governance in China, through provincial and local governments optimising their information disclosure systems, taking action to encourage public engagement, and establishing high quality mechanisms to enable interaction between citizens and relevant government departments. Ideally this would be accompanied by monitoring and enforcement from National government to ensure these institutional changes to current local decision-making happen.

In addition to the distributions typically defined in the Western literature of equal opportunity and freedom for individuals to meet their basic needs, transport equity goals in China need to include equal opportunity for people to contribute to community and national development. In terms of what constitutes a fair distribution, based on Confucianism and Socialism, maximising the development prospects of disadvantaged groups is considered to be the most proper principle for transport equity in China. However, responses from Chinese practitioners showed that though this principle is widely accepted as a final vision, it may not be practical in many smaller Chinese cities due to their limited resources and capability. Hence, there should be no one-size-fits-all principle for transport equity for China. Whether the distributive principle should be based on establishing a baseline which everyone meets or providing maximised welfare gains for disadvantaged groups should be selected based on local socio-economic development conditions.

Though there are some differences between the initial conceptual framework, current practices, and the views of practitioners, no significant conflicts were found. Instead, the key aspects of three dimensions of transport equity extracted from the contemporary transport planning approaches and the traditional philosophical traditions and current Chinese cultures are linked and complementary. For example, from the interviews, the distribution of economic impacts was added as an important aspect of transport equity, which were not fully addressed in academic research. While the critical review suggested that Egalitarianism would be the appropriate distributive principle for transport equity in Chinese cities, interviewees argued that establishing a baseline for disadvantaged groups may be more practical for small- to medium-sized cities with limited resources and capability, this was supported by our analysis of transport appraisal documents. Fig. 2. summarises how the initial conceptual framework has been modified following the document review and analysis of the interviews with practitioners. The differences between the initial framework and the modified framework are highlighted in bold.

7. Conclusions

This paper has provided a conceptual framework for defining transport equity in China through (1) identifying the range of benefits and burdens to be distributed, such as accessibility to jobs, key services, and activities related to Chinese culture; (2) clarifying who the appropriate target groups should be, such as people without urban or local Hukou; and (3) recognising that the proper distributional principle should generally be maximising the development prospects of disadvantaged groups, while acknowledging for some cities with limited capability and resources, the principle of ensuring a threshold for every

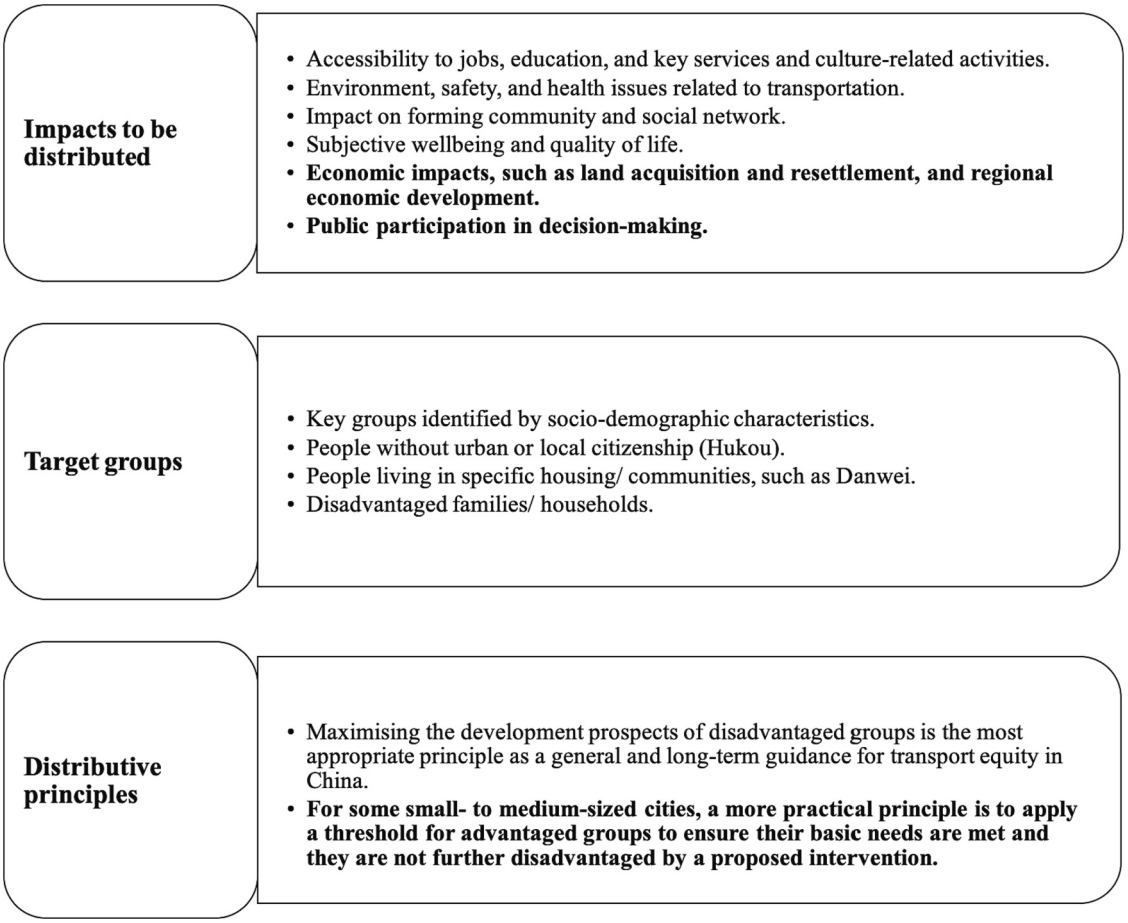

Fig. 2. Modified conceptual framework for transport equity in China.

citizen to meet their basic needs is more practical.

The proposed conceptual framework can act as a foundation for improving equity in the transport sector in different Chinese cities. As there is no established definition of transport equity in Chinese government policy, this framework provides a general guide for setting transport equity goals, selecting appraisal tools and defining a range of transport equity indicators. In this way, this conceptualisation of transport equity can be applied to assess whether a proposed transport intervention helps to improve equity in China, with some caveats. Firstly, the discussion of the differences between Chinese and Western context is a simplification within the space available for a journal article, but it can act as a starting point for future discussion. Secondly, since the availability of online information for many smaller-sized Chinese cities is generally low, important evidence from these kinds of cities may be missing. Additional fieldwork may be needed to better understand transport equity in small-sized cities. Lastly, the proposed framework has not been tested. It would be useful to gain the views of practitioners and the general public on the framework and to apply the framework to a number of case studies.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

Zhengyue Wan: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft. **Helena Titheridge:** Supervision, Validation, Writing – review & editing.

Declaration of competing interest

No potential conflict of interest was reported by the author(s).

Data availability

Data will be made available on request.

Acknowledgements

The authors would like to thank the transport practitioners from China who provided documents or comments for this research project, and the participants of our interviews.

Appendix A. Key words for searching academic literature

Equity	Division	Transport
Equity	China	Transport planning
Equality	Neoliberal	Transport appraisal
Fairness	Western	Transport geography
Social justice	Global North/ South	Accessibility
Relative deprivation	City	Travel
Social Comparison	Local	Urban transport
Social sustainability	Concept	Public transport
	Definition	Traffic
	Theory	Transportation
	Literature review	Mobility

Appendix B. List of project types reviewed for each provincial-level administrative region

Provincial-level administrative region	Local transport plan & Integrated transport project	Public transport project	Road construction project	Other transport project
Anhui	2	2	1	1
Beijing	2	3	2	3
Chongqing	1	2	1	1
Fujian	2	2	2	1
Gansu	1	2	2	1
Guangdong	3	3	2	2
Guangxi	1	2	1	1
Guizhou	1	1	2	1
Hainan	1	1	1	0
Hebei	1	2	1	1
Heilongjiang	2	3	2	1
Henan	2	2	1	1
Hubei	2	2	2	1
Hunan	3	3	3	2
Inner Mongolia	1	1	1	0
Jiangsu	2	3	2	2
Jiangxi	1	2	2	0
Jilin	1	1	2	1
Liaoning	2	2	1	1
Ningxia	1	2	2	0
Qinghai	1	1	1	0
Sichuan	2	3	3	1
Shaanxi	1	2	2	1
Shandong	1	3	2	1
Shanghai	2	4	3	4
Shanxi	1	2	1	1

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(*continued*)

Provincial-level administrative region	Local transport plan & Integrated transport project	Public transport project	Road construction project	Other transport project
Tianjin	1	3	1	1
Tibet	1	0	0	0
Xinjiang	1	1	0	0
Yunnan	1	2	2	1
Zhejiang	2	3	1	1

Appendix C. List of interviewees

Participant	Job	Provincial-level administrative region
1	Consultant	Guangdong
2	Scholar	Shanghai
3	Public servant (local government)	Hunan
4	Scholar	Fujian
5	Scholar	Beijing
6	Public servant (provincial government)	Ningxia
7	Consultant	Jiangxi
8	Public servant (local government)	Hunan
9	Consultant	Jilin
10	Consultant	Tianjin
11	Public servant (local government)	Sichuan
12	Consultant	Jiangsu
13	Scholar	Shanghai
14	Public servant (provincial government)	Shaanxi
15	Public servant (local government)	Guangxi
16	Scholar	Shanghai

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