Reinterpret 4As framework of energy security from the perspective of human security – an analysis of China's electric vehicle (EV) development

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Summary:

This research addresses two issues: expanding the understanding of human security with the case of China's electric vehicle (EV) development and examining the human security implications of China's EV development. This research adopts an online ethnographic method to record personal driving forces and barriers to China's electric vehicle (EV) uptake through experiences shared by ordinary Chinese people. Theoretically, this research provides evidence for the applicability of the broad human security approach in energy security analysis through the case of China's EV development. By reinterpreting the 4As framework (availability, affordability, accessibility, and acceptability), this research challenges the current understanding of human security by demonstrating that threats to human security touch not only the most vulnerable but also people living in well-developed regions in the face of the lasted technological transformation. This research enriches the understanding of human security by exploring how it has been adapted to the Chinese social and political context. Drawing on the insights from ontological security, this research emphasises the necessity of incorporating the subjective dimension in human security analysis to capture subjective feelings in everyday security. This research contributes empirically to identifying human security implications of China's EV development. Informed by the flexible interpretation of security agency offered by the broad human security approach, this research demonstrates that apart from the state's dominant position as the primary security provider, other players, such as carmakers, also play an important role in shaping people's perceptions of how secure EVs are. Recognising that misoperations of an automobile can cause serious physical harm to both those on board and other road users, this research argues that ordinary people should not be only considered as the object of protection but also as the agent with the power to exert influence on the security implications of the new technology.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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Date **01/09/2022**

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated.
Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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STATEMENT 2

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Abstract

This research addresses two issues: expanding the understanding of human security with the case of China's electric vehicle (EV) development and examining the human security implications of China's EV development. This research adopts an online ethnographic method to record very personal driving forces and barriers to China's EV uptake through the experiences shared by ordinary Chinese people. From a theoretical perspective, this research provides more evidence for the applicability of the broad human security approach in energy security analysis through the case of China's EV development. By reinterpreting the 4As framework (availability, affordability, accessibility, and acceptability), which is one of the most frequently adopted frameworks in the analysis of energy security on the state level, (Cherp & Jewell, 2014, p. 416), this research challenges the current understanding of human security by demonstrating that threats to human security exist at all levels of development and touch not only the most vulnerable but also people living in well-developed regions in the face of the lasted technological transformation. The analysis of China's EV development as a strategic energy security consideration sheds some light on the complicated relationship between state and individual security within China's security discussion. It enriches the understanding of human security by exploring how it has been adapted to the Chinese social and political context. Meanwhile, drawing on the insights from ontological security through the lens of some key indicators (protection, autonomy, and social acceptance), this research emphasises the necessity of incorporating the subjective dimension in human security analysis to capture subjective feelings and psychological factors in everyday security.

This research contributes empirically to identifying human security implications of EV development based on the real-life experiences shared by the Chinese people, which may constitute barriers to China's EV uptake. Informed by the flexible interpretation of security agency offered by the broad human security approach, this research demonstrates that apart from the state's dominant position as the main security provider, other players, such as carmakers, also play an important role in shaping people's perceptions of how secure EVs are. Recognising that the misoperation of an automobile can cause serious physical harm to both those on board and other road users, this research argues that ordinary people should not be only considered as the object of protection but also as the agent with the power to exert influence on the security implications of the new technology.

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Abbreviations

AAA American Automobile Association

ADAS Advanced Driver Assistance Systems

APERC Asia Pacific Energy Research Centre

BRI Belt and Road Initiative

CAAM China Association of Automobile Manufacturers

CATARC China Automotive Technology and Research Centre

CADA China Automobile Dealers Association

CPCA China Passenger Car Association

HDR Human Development Report

FCV Fuel Cell Vehicle

FSD Full Self-Driving

ICEV Internal combustion engine vehicle

ICV Intelligent connected vehicle

SAE Society of Automotive Engineers

ICCT The International Council on Clean Transportation

IDMC Internal Displacement Monitoring Centre

IEA International Energy Agency

IRENA International Renewable Energy Agency

MIIT Ministry of Industry and Information Technology of the People's Republic of China

NDRC National Development and Reform Commission

NEV New energy vehicle

UGC User-Generated Content

UNCHS United Nations Commission of Human Security

UNDP United Nations Development Programme

UNGA United Nations General Assembly

UNICEF United Nations International Children's Emergency Fund

UNTFHS United Nations Trust Fund for Human Security

V2G Vehicle to Grid

Chapter 1 Introduction

The past decade has witnessed a fast transition to sustainability in the energy sector. The advancement in new technologies and the acquirement of alternative energy resources are transforming the global energy scenario, including the types of energy resources available to people and how people access energy. In the face of the climate crisis and the urgent need to curb carbon emissions, governments have set aggressive goals for electric vehicle (EV) development, which is commonly agreed as an effective way to cope with climate change. (IEA, 2016) There is, however, less discussion on the impacts of this acclaimed green solution on the lives of ordinary people. How exactly people's lives will be impacted by the automobility transformation has not been given enough attention.

Energy is needed for individual survival. Access to energy services, including services that help meet people's mobility needs, is a prerequisite to human development. "With energy services key to both modern economies and post-modern lifestyles, energy security is paramount to human security." (Sovacool & Mukherjee, 2011, p. 5343) The concept of human security first drew global attention in the United Nations Development Program's 1994 Human Development Report, which aims to "make a transition from the narrow concept of national security to the all-encompassing concept of human security". (UNDP, 1994, p. 23) The shift of focus from national to human security means that the answer to the questions of security by whom and for whom has changed. The study of human security shifts attention away from the focus on securing the state from threats caused by the use and control of military force to the question of how to secure people's freedom from fear and want. (Peou, 2014, p.1)

The human security approach argues for the expansion of the scope of global security in seven areas to include threats in arguably every aspect of human life and welfare: "economic security, food security, health security, environmental security, personal security, community security, and political security". (UNDP, pp. 24-25) It is interesting to notice that within such a comprehensive and all-inclusive approach, energy, which is fundamental for human survival and livelihood and is explicitly linked to nearly all dimensions covered under the original UNDP definition of human security, has rarely been systematically discussed. (Karlsson-Vinkhuyzen & Jollands, 2013)

Two factors may have contributed to the marginalisation of energy in human security. The first, this research argues, lies in the limitations in the current understanding of the analytical potential of the human security approach. As examined in more detail in Chapter 2, the human security inquiry features the debate on the scope of security, namely the narrow/broad school debate. (Owen, 2004; p. 375) Differentiated thinking regarding what constitutes threats facing individuals within the human security approach spurred heated debates pitting a narrow approach based on the concept of *freedom from fear* and a broad approach on the *freedom from want*. The conceptual analysis of the UNDP human security approach, widely acknowledged as the first official appearance of the human security concept and a representation of the broad human security approach, conducted in Chapter 2 reveals that there is a lack of thorough comprehension of what the broad human security approach entails within the existing literature in answering such questions as security for whom, for what value and from what threats, and by what means. This limitation may have led to the limited adoption of the approach in energy-related areas, including EV development, one of the latest energy technology applications in the global energy transition.

The other reason, well examined in the existing literature, lies in the state-centric narrative prominent in the current energy security research. (Nyman, 2013) "Energy security is not just a matter of energy; it is about how energy affects national security." (Hillebrand, 2016) Energy issues started catching security scholars' attention during the 1970s oil crisis. The prevailing global energy condition during that time determines that the assurance of energy availability is the core of energy security. (Azzuni & Breyer, 2018, p. 3) Today, energy security is still widely understood as "the uninterrupted availability of energy sources at an affordable price". (IEA, 2014) It is achieved when fossil fuel prices are stable and the state enjoys stable access to energy supplies, "whether through own production or reliable import". (Nyman, 2013, p. 3) While other referent objects have been adopted apart from the state due to the introduction of theoretical approaches to human and environmental security, the importance of energy to military building, economic power, and, most fundamentally, state survival has ensured that the concept of energy security has remained almost exclusively state-centric. (Simpson, 2013, p. 1) The mindset that considers energy security equivalent to national security has hindered the efforts to grasp the complete picture of the area. One major problem of this state-centric approach is the marginalisation of human security perspectives in energy security research. Walker (1990, p. 3) calls the prevailing understanding of security, which is closely tied to the statist claims to justify the legitimate authority of the state, a dilemma as he claims that even if

threats to people's living and well-being as well as potentially massive ecological disruptions are arising and causing more concerns, both the prevailing interpretation of what security is and the resources mobilised to put the interpretation into practice are fixed primarily in relation to sovereign states. The equation between energy and national security is mostly taken for granted and rarely questioned in the current literature, while individual and community dimensions are largely ignored. As a result, the connection between energy security and human security is by far mostly blurred. Dannreuther (2010: 147) highlights that human security is 'one of the most neglected dimensions of the energy security debate'.

Energy security is not only a matter of strategic importance for national security. It is also about how energy affects the security of human beings. Energy security needs to be recognised at the micro level in terms of people's everyday life. This idea constitutes the starting point of this research, as it indicates the gaps in the existing literature, which, this research argues, are important to fill in. From a theoretical perspective, there is a lack of comprehensive understanding of the analytical utility of the broad human security framework, which partly explains why energy is less visible in human security studies. From an empirical perspective, energy is essential in everyday life. The human security approach may prove helpful in understanding the energy insecurities facing ordinary people, which have so far largely escaped critical scrutiny.

The ongoing unprecedented energy transition provides an excellent opportunity to approach these gaps. As will be argued in Chapter 2, energy plays a unique role in understanding human security from a theoretical perspective. Human security was introduced in response to the limitations of the traditional national security mentality. It recognises the potential negative impacts of pursuing state security goals on human security by pointing out their complicatedly interlinked relations. Energy helps link security on both levels thanks to its traditional state-centric understanding and essential role in people's daily lives.

The latest development in the energy transition is regarded as a missing link in the mainstream energy literature. (Proskuryakova, 2018, p. 207) The transition will last in the foreseeable future, and it is still too early to evaluate in a broad sense what this transition means from a human security perspective. However, significant changes have been made in some sectors on a relatively large scale. Among all forms of ongoing energy transitions, this research chooses China's EV development as the case to explore the analytical utility of human security. As this

research aims to explore human security, areas most closely connected to people's everyday lives or by which human security is most widely influenced are the targets of the case selection. The development of the EV industry has gained momentum in the past decade. It has, at the same time, already exerted a significant influence on the lives of many. Sales of electric cars topped 2.1 million in 2019, which boosted the stock to 7.2 million worldwide. (IEA, 2020, p. 10) As the largest EV market in the world, China has a relatively well-developed EV industry, which has already affected the lives of millions of Chinese people. As discussed in the empirical chapters of this research, private car use is deeply ingrained in how people make sense of and navigate not only their streets but their place in the world. Changes in mobility trends and behaviours have profound human security implications, not only in terms of the narrow understanding of physical security but also in a broad sense of well-being and full development. EV development constitutes a good case study and provides an important prism through which the analytical utility of the broad human security approach can be better explained and further explored. Meanwhile, since the Chinese context is very different from the west, where the human security approach was introduced, this human energy security research will also examine how human security is understood and approached in China, which will also contribute to the theorisation and understanding of the broad human security approach.

As noted earlier, energy constitutes an ideal angle to understand the relationship between security on the state and individual levels. This is well embraced by the case of China's EV development. Chapter 3 will examine in detail that China's EV industry is of strategic importance on the state level in both ensuring the country's energy security by reducing its imported oil dependence and gaining an advantage in the new round of green energy competition. In contrast, the industry's less satisfying performance in the domestic market, demonstrated by the constantly rectified sales goals (Wan et al., 2015; Hou & Li, 2020), indicates that the aggressively policy-driven development is facing a relatively low acceptance rate by the Chinese people. EVs are still widely regarded as "risky" mobility. (Tyfield & Zuev, 2018, p. 259) The insecurity and uncertainty people face and feel towards EVs in meeting their mobility needs can be sensed from the concerns shared by the Chinese people. Various concerns, such as the unsatisfying driving ranges, lack of sufficient public charging infrastructures, and performance uncertainty in different weather conditions, are frequently seen in EV-related public discussions on social media. These concerns may have kept people from accepting the government's efforts to promote EV development as an industry of strategic importance. Drawing on China's holistic national security strategy, which prioritises the

security and well-being of its people (China Internet Information Centre, 2016), this research argues that the domestic market and the ordinary people's concerns matter in the context of China's national security needs.

Here come the empirical considerations of bringing together the two notions - human security and China's EV development - and approaching the gaps identified earlier. This research argues that in order for the Chinese EV industry to develop sustainably and fulfil its strategic mission in the new energy geopolitics, the government needs to take into account the human security dimension of the EV development, that is, the voice of ordinary people, and recognise the insecurities facing people embedded in the new mobility development. People being secure is referred to in China's holistic view of security as the foundation for state security. Translating it into the EV development context, winning the domestic market and the acceptance of ordinary people is necessary for its sustainable development, which ensures that the industry provides the necessary impetus for China to enhance its energy security by constantly reducing its reliance on imported oil. The key to the ultimate success of China's green revolution, the transition of the transportation industry in the context of this research, is the acceptance of the idea by the mass public and the following lifestyle transformation. This ambitious plan in the mobility sector requires more "cooperation" from ordinary people. "The discourse and practice of human security leads states and policymakers to focus on different issues, to ask different questions, and to promote different policies…" (Krause, 2007, p. 2) A human security approach is necessary for understanding the implications of China's EV development as a national energy security strategy on its people, which cannot be explained through traditional security thinking.

To sum up, this research is conducted with two purposes: to contribute to the existing human security literature by enriching the broad human security approach from the perspective of human energy use through the lens of China's EV development and to explore what a human-centric view can tell about the sustainable development of China's EV industry. Chapter 2 will explain why and how the case of EV development in China, a significant part of the country's energy transition and industry of strategic importance, provides an ideal lens through which to better appreciate the conceptualisation and analytical utility of the broad human security approach. The chapter will examine the gaps in the current human security narrative and how, from a theoretical perspective, the case study of China's EV development will contribute to alternative understandings. Built on the theoretical analysis conducted in Chapter 2, Chapter 3

focuses on how the human security approach will help understand China. It will examine in more detail why a human security approach is necessary for understanding the implications of China's EV development as a national energy security strategy on its people, which cannot be explained through traditional security thinking, and more importantly, how this understanding at the individual level has the potential to inform the sustainability of the industry, which is necessary for it to serve its strategic purposes on the state level.

Research questions

Based on the discussion above concerning the theoretical and empirical motivations for bringing human security and China's EV development together, this research proposes to answer the following research questions:

1. How does the exploration of China's EV development contribute to the broad understanding of the human security framework?

2. How does a human-centric perspective help advice in empirical terms on the sustainable development of China's EV development, which is strategically important in improving China's energy security?

Research outline

This research aims to bridge the gaps by expanding the understanding of the human security approach with the case study of China's EV development and examining the human security implications of China's EV development. One clarification needs to be made at the beginning. This research addresses the transformation in human mobility made possible by the electrification of private passenger cars. EVs in this research refer to the electric automobiles used by Chinese households on a daily basis. It does not include other forms of electric vehicles such as electric buses, even though other forms of electric vehicles also exert impacts on people's daily life and deserve academic attention. As noted earlier, chapter 2 and chapter 3 explain the reasons and motivations for bringing the two keywords - human security and China's EV development - together and illustrate in detail what this research will contribute. As will be examined in Chapter 2, the analytical utility of the human security approach is

questioned by scholars as it is treated as normative guidelines rather than comprehensive analytical frameworks through which energy security in specific situations facing a specific group of people can be systematically assessed. Much work is yet to be done exploring human security's analytical utility. Establishing new human energy security assessment frameworks to evaluate individual energy security in a more systematic way can be an essential part of it. Chapter 4 does the job by proposing the human security-based analytical framework. The 4As framework (availability, affordability, accessibility, and acceptability) is widely adopted in state-level energy security analysis. Chapter 4 reinterprets the four parameters identified in the framework with the individual as the referent object and assesses the implications of EV development on the individual level. As noted in Chapter 2, the subjective dimension of security is highlighted in the broad school of human security. To further explore this dimension, Chapter 4 also introduces the notion of ontological security in the analysis of each parameter of the As framework. It is proven to help capture individual experiences of security in the everyday context and identify a broader range of threats to individual energy needs in China's EV development.

Chapter 5 proceeds with the introduction of the netnography method adopted in this research for data collection and analysis. It explains how data is collected on social media with the aim of engaging with the real-life experiences of ordinary Chinese people. From a methodological perspective, this research welcomes the involvement of ordinary people as contributors to the security dialogue. The user-empowering and enabling features of social media are in line with this human security research that emphasises the role of people. Based on the "most likely" case selection strategy (Wu & Wall, 2019, p. 1716), this research collects data mainly from two popular Chinese social media platforms, *Zhihu* and *Bilibili*, in order to maximise the likelihood of observing people sharing experiences regarding tremendous changes brought by the automobile industry transition.

The following four empirical chapters will reinterpret the four parameters of the As framework respectively in the exploration of the human security implications of China's EV development. Drawing on the key indicators identified in the ontological security approach (protection, autonomy, and social acceptance), these four chapters aim to draw a dynamic picture of the implications with a focus on engaging with the real-life experiences, emotions, and thoughts of ordinary Chinese people.

Chapter 6 addresses issues around availability. It looks into changes to the availability of the functionality of the car, that is, automobility services available for people to use in meeting their essential mobility needs, in the automobile industry transformation. Cars ontologically secure and empower people with both their utilitarian and affective-symbolic features. The functionality changes, both empowering and disempowering, along with technological development experienced by ordinary Chinese people, raise real human security implications. Chapter 6 explores how these automobile functionality changes affect people and how their mobility needs are met on a daily basis.

Availability focuses on changes in the characteristics of automobility itself in meeting people's utilitarian and psychological needs. The following two chapters, affordability and accessibility, address changes in people's access to automobility along the transformation. Chapter 7 addresses the financial factors impacting people's access to automobility, and Chapter 8 deals with other issues concerning access, such as EV charging facilities. As usually the second largest family expenditure after housing (Dawson, 2017, p. 3), car adoption is closely connected to people's economic security, an essential pillar identified in the UNDP human security framework. Chapter 7 deals with financial considerations, including the financial incentive policies and the introduction of budget EVs, in China's EV policymaking and their implications on people's access to mobility services essential to their daily lives. Based on the financial considerations discussed in Chapter 7, Chapter 8 proceeds further with two access-related issues - restrictive transport policies and the charging infrastructure dilemma. The experiences shared by insecure early EV adopters and their attitudes towards access-related topics tell a good story of significant barriers to full access to EVs amongst the Chinese public, which helps complement the affordability chapter in providing a finer-grained picture of EV access amongst the Chinese public and prove with evidence that the threshold to EV access remains high for many.

Even though this research adopts the broad human security approach, Chapter 9 on acceptability aims to remind the reader that the connection between the two keywords of this research, namely human security and China's EV development, is also underpinned by conventional security considerations on physical safety. Acceptability is interpreted in this research through the notion of *vital core* in the human security narrative with an emphasis on the existential security considerations brought by EV development in China. Chapter 9

addresses acceptability by focusing on two fundamental issues concerning China's EV development that pose existential threats to human security: environment and driving safety.

Based on the research gaps identified and the empirical observations discussed in earlier chapters, Chapter 10 summarises the key findings of this research, answers the research questions, and discusses the value and contribution of this research from both theoretical and empirical perspectives. It also proposes opportunities and directions for future research.

Chapter 2 Human security

Introduction

This research addresses two issues: expanding the understanding of the human security approach with the case study of China's electric vehicle (EV) development and examining the human security implications of China's EV development. Chapter 2 and Chapter 3 will explain the reasons and motivations for bringing the two keywords - human security and China's EV development - together and illustrate in detail to what this research will contribute. This chapter deals with the first one - human security, examining the gaps in the current human security narrative, how these gaps are demonstrated in the case of China, and how, from a theoretical perspective, the case study of China's EV development will contribute to alternative understandings.

Since its introduction in the United Nations Human Development Report (HDR) (UNDP, 1994), human security has been developed as a response to the limitations of the traditional security concept. It extends the scope of security concerns from those facing national sovereignty to those affecting the daily lives of individuals. The all-encompassing idea has caught the attention of scholars and policymakers, with a mix of supporters and opponents featuring the debate on the scope of security, namely the narrow/broad school debate. (Owen, 2004, p. 375; King & Murray, 2002; Krause, 2004; Krause, 2007; Mack, 2004; Macfarlane, 2004; Tadjbakhsh, 2013; Nef, 1999)

This chapter will start with an overview of the debate and explain why this research takes the broad approach to address the EV development issue. It will then continue with a conceptual analysis of the UN human security framework, which is widely acknowledged as the first official appearance of the concept and a representation of the broad human security approach. The conceptual analysis will clarify two issues closely linked to this research's theoretical contribution. It will identify the limitations in the current understanding of the broad approach regarding who and what values to protect, which will help explain why energy issues, especially the ongoing energy transition, have not been widely included in the human security

analysis, despite its irreplaceable role in people's everyday life. (Karlsson-Vinkhuyzen & Jollands, 2013) Meanwhile, the conceptual analysis will also respond to the agency-related criticism of human security by arguing for the exploration of other possible security providers in addition to the state.

A literature review on energy security will be incorporated to illustrate the unique role of energy in understanding human security. This chapter will then bring the focus to China and explain how human security has been understood in the Chinese context and how the limitations identified above take their unique forms in the Chinese context. The limitations in the current understanding of the broad human security approach identified in the conceptual analysis in terms of the scope of security and alternative security agency, as well as their contextualisation in China, will lead to the final section of this chapter, which will explain how China's EV development will contribute to alternative interpretations of the human security framework. The section will explain why and how the case of China's EV development, a significant part of China's energy transition with strategic importance, will provide an ideal lens through which the analytical utility of the broad human security approach can be better appreciated.

2.1 Human security – narrow and broad

Even though the origin of human security is still contested, and some scholars argue that human security can be traced back much earlier and was already coined or used under other labels (Mack, 2004, p. 366; Bosold, 2012; MacFarlane & Khong, 2006; Newman, 2021), it is still widely accepted that this innovative thinking of security was first brought to the attention of the world by the United Nations in its 1994 Human Development Report (HDR). It was a response to the concern that the traditional conceptualisation of security entails a narrow realist-oriented understanding of security threats emanating from external sources. (Tadjbakhsh & Chenoy, 2006; Andersen-Rodgers & Crawford, 2018) Security policy has been focusing on the efforts to "sustain and promote the core values of states" – "sovereignty and territoriality" – "in their relations one with another". (MacFarlane & Khong, 2006, p. 1) Realising that a feeling of insecurity arises for most people "more from worries about daily life rather than from dread

of a cataclysmic world event" (UNDP, 1994, p. 3), the UNDP believes that a dimension in the security narrative that engages closely with people is mostly missing, and a more inclusive manner of thinking about security to uncover people's specific needs and vulnerabilities is needed. It is necessary to extend the focus from threats facing states brought by external aggression to include those forms of insecurity faced and felt by people arising from their daily lives. At the core of human security lies the "desire to challenge the dominance of 'high politics' in security policy and analysis, and to envision a reorientation around individual everyday experiences of deprivations and insecurity". (Newman, 2022, p. 5) Simply put, the premise is the assumption that "the individual human being is the only irreducible focus for discourse on security". (Shani, 2017, p. 6) The legitimacy of claims of all other referents, including the community, the nation, and the state, comes from the "one genuine sovereignty" of the individual. (Havel in MacFarlane & Khong, 2006)

A range of scholarly and policy efforts are built on the human security approach. (UNDP, p. 2) On the one hand, human security is, to some extent, "consensual" as a step forward and a necessary outcome of the "political struggles of widening and enlarging security". (Büger, 2008) It has even "acquired the status of a new orthodoxy amongst many practitioners and students of security studies and international relations more broadly". (McGrew, 2007) On the other hand, however, it is accused of being too broad, vague, expansive, opaque, slippery, uncritical, and even meaningless. (Paris, 2001; Newman, 2010) Critics see it as merely a rallying cry rather than a paradigm shift, as it failed to provide an alternative paradigm to radically challenge the traditional one. (Paris, 2001)

Contentions concerning human security can partly be explained by the expansiveness of its concept. (Paris, 2004) While the referent object of security discourse seems clear within the human security framework, conflicting ideas exist as to what the individual should be protected from. (Shani, 2017, 6) The "dichotomous broad-versus-narrow conceptualisation" has been central to the human security debate. (Owen, 2004, p. 375) Differentiated thinking in terms of what constitutes threats facing individuals within the human security approach spurred heated debates pitting a narrow approach based on the concept of *freedom from fear* and a broad approach on the *freedom from want*. [1]The narrow school is proposed by a coalition of like-

[1] The limitations of this clarification have been recognised in Liotta & Owen (2016), as Owen noted that the "freedom from fear" and "freedom from want" categorisations are "one-dimensional". While some definitions

minded “middle power” governments such as Canada and Norway and a group of scholars who propose narrowing the concept by restricting threats to direct physical violence for reasons of “pragmatism, conceptual clarity and analytical rigor” (Owen, 2004; p. 375; King & Murray, 2001; Krause, 2004; Krause, 2007; Mack, 2004; Macfarlane, 2004) The broad approach is adopted in the works of the UNDP, (1994) the UN-appointed Commission of Human Security (CHS), (2003) and a host of academics (Liotta & Owen, 2006, p. 41) who want to go beyond and embrace menaces to all areas of human lives so as to preserve the concept’s holistic flexibility and inclusiveness. (Tadjbakhsh, 2013; Nef, 1999)

The narrow school argues that the agenda should be narrowed down to those life-threatening threats facing individuals, as they believe a precise, “practical,” and “workable” human security definition is needed as the foundation of human security research. (Krause, 2004, p. 368; Newman, 2010) It argues for narrowing down the concept to cover only tangible physical security issues and, therefore, limiting human security research to particular types of existential threats facing human beings, which helps avoid “the dangers of vague and amorphous conceptualisations”. (Liotta & Owen, 2006, p. 52) For the proponents of the narrow approach, a “workable” definition of human security is necessary to make the concept meaningful, as explained by the Human Security Centre at the University of British Columbia:

> For some proponents of human security, the key threat is violence; for others, the threat agenda is much broader, embracing hunger, disease, and natural disasters. Primarily for pragmatic reasons, the Human Security Centre has adopted the narrower concept of human security that focuses on protecting individuals and communities from violence. (Liotta & Owen, 2006, p. 43)

Out of pragmatic reasons, a mechanism to identify priorities and ensure enough resources to deal with the insecurities is needed. Security providers must deal with competing demands for attention, resources, and immediate actions. It is, therefore, a crucial step to positively affirm what comprises human security and what is concurrently disqualified. (Grayson, 2004, p. 357) Broadening the agenda of threats covered within the framework will lead to a lack of prioritisation and hierarchy of threats. Human security, at a certain point, will become a loose synonym for bad things that can happen to human beings, which makes the concept unworkable.

might be broad in that they stress “human development priorities”, they can be very narrow in the scope of threats included in their analysis. (Liotta & Owen, 2016, p. 53)

(Krause, 2004, p. 44)

Broad school upholders, on the contrary, believe that a broad conception of human security is necessary for a comprehensive understanding of contemporary crises facing human beings. (Tadjbakhsh, 2013, p. 46) Living in a globalised world, we "can no longer afford solely to emphasise national security issues without recognising that abstract concepts such as values, norms, and expectations also influence both choice and outcome". (Liotta & Owen, 2006, p. 51) The broad approach challenges the top priority given to a "workable" definition of human security by narrow school scholars from several perspectives. The first argument concerns the exercise of defining itself, which is an act of certain actors and can never be neutral or objective. (Tadjbakhsh, 2013, p. 43) "[C]onstructing a closed and limited" definition is believed to stifle alternative thinking and reinforce orthodoxy. (Stoett, 1999, p. 3) Security itself is "an essentially contested concept". (Buzan, 1983, p. 6) The exclusive focus on survival needs and threats from physical abuse and violence of the narrow school does little to protect the millions suffering from nonviolent preventable human security threats. (Liotta & Owen, 2006, p. 52) Being criticised as "sacrificing analytical rigor and policy clarity for inclusiveness", broad proponents contend that the narrow approach "sacrifice[s] nonviolent threats for policy utility". (Liotta & Owen, 2006, p. 51) Security goes beyond mere survival from direct threat to physical integrity to a life worth living. Undoubtedly, a workable definition will facilitate the work of researchers. It is equally important, however, to capture the "real" life of people. Those falling out of the list of "existential" threats can also cause significant damage to human beings, in both physical and mental terms, which can be as harmful as tangible violence. In this sense, instead of a conceptual weakness, human security, as some argue, thrives on its ambiguity, "manifesting for various purposes in various contexts". (Liotta & Owen, 2006, p. 51) The lack of an agreed-upon definition can be a refusal to the dominant security agenda as it opens up the possibility of drawing attention to peripheral issues in security studies. (Tadjbakhsh, 2013, p. 46) The broad school argues that human security should be treated as a normative evaluation framework, making value judgments on whether an act is morally acceptable based on its outcomes for individuals. (Tadjbakhsh, 2013, p. 45) "It is rather a paradigm and a concept that allows recognition of threats and vulnerabilities to the full potential of an emancipated life". (Tadjbakhsh, 2013, p. 45)

The second contention of the broad approach is the call for a broader understanding of security agency. It is a response to the academic attempt of narrow school proponents to set up a

threshold of threats based on their severity, or the hierarchy of threats, so that policymakers, or the state, can prioritise amongst competing goals (Paris, 2001; Burgess & Owen, 2004) and come up with strategies to deal with urgent threats to survival. "The closer the concept gets to its original UNDP conceptualisation, the more difficult both human security policy and theory become." (Liotta & Owen, 2006, p. 51) The prioritisation or hierarchy of threats believed necessary in the narrow understanding for a workable human security definition, which the broad school fails to provide, assumes that responsibility for "action" rests only with political elites who face competing demands for their political attention and resources. (Tadjbakhsh, 2013, p. 46) Nevertheless, the broad school argues that if there is a change in the understanding of security that goes beyond the limit to survival needs and covers menaces to welfare and dignity, the security situation of the people can be complex and needs a coalition of approaches and actors. This "coalition" empowers people to be the agents achieving security, not just the referents needing security. "Threats to human dignity need to be recognised as such, even if they may or may not solicit action by political elites. If one accepts security as a personal feeling, and not the prerogative of the state, then 'securitisation' should not automatically raise alarms to send in the troops so to say." (Tadjbakhsh, 2013, p. 47)

Another less visible dimension of the broad school is the recognition of the subjectivity inherent in human security as personal feelings. Security is termed as "the absence of anxiety upon which the fulfilled life depends". (Liotta & Owen, 2006, p. 40) The "inspirational broad idea" of human security "examine[s] both subjective and objective insecurities". (Gomez et al., 2013, p. 8) Recognising that security can be subjective, and values and threats can be perceived differently by different states, Wolfers characterised security as "the absence of threats to acquired values". (Wolfers, 1952, p. 485) Buzan (1983, p. 19) sees security as 'being protected from danger, feeling safe, and being free from doubt". Security is thus "achieved if there is an absence of objective threats and subjective fears to basic values". (Brauch, 2011, p. 99) Even though the referent object in Wolfers' definition of security was the state, the logic of perceiving security as a subjective notion can be applied to the conceptualisation of human security. Security is defined in the *Oxford English Dictionary* as "the condition of being protected from or not exposed to danger; safety ... freedom from care, anxiety, or apprehension; a feeling of safety or freedom from an absence of danger." (King & Murray, 2001, p. 592) This definition of security echoes Wolfers' with a highlight on the subjectivity inherent in security. If individuals are taken as the object, security has to be defined and explored as both objectively tangible experiences and subjective perceptions at the micro level. Threats to human security

can be both objective, which can be measured against quantitative indicators, and subjective, which requires qualitative exploration of how people feel. (Tadjbakhsh, 2013, p. 45)

Human security means a localised, subjective sense of security for individuals. Security lies in the subjective experiences of individuals, which can be spurred from various reasons in different contexts. In this sense, it finds specific meanings in specific contexts and subjectivity. Contextual analysis is therefore of utmost importance to identify the nuances of securities and insecurities experienced and perceived by an individual. For example, being well integrated into his family and community, someone may perceive himself as secure, even though he lives under $4 a day. At the same time, a person working in a developed city with a steady income may feel insecure due to competition at work, unhappy marital relationships, or other uncertainties in the future. Security penetrates every aspect of human lives. People experience different levels of security in different areas of life, and their perceptions of security change with time. In this case, people's experiences of insecurities can be logically different from that of the state's concern for national security. The objective part can be measured against quantitative indicators. In contrast, the subjective part requires contextualisation and an in-depth qualitative assessment of how people feel about security, which is currently marginalised in security studies. The feeling of security goes "beyond mere existence (survival) to life worth living, hence, well-being and dignity." (Tadjbakhsh, 2013, p. 44)

This research has no intention to compare the two approaches in terms of which is better. However, the illustration above is still necessary as it makes sense to clarify that the theoretical focus of this research is the broad human security approach. There are mainly two reasons. The first reason concerns the intention of this research to theoretically contribute to the existing literature by problematising the current broad human security approach and proposing alternative understandings. As will be explained later in more detail, the lack of discussion about energy in human security can, in part, be explained by the limited understanding of the human security approach, especially the broad one, in the existing literature. The other reason is empirical as the broad approach is deemed more suitable to address the security issues concerning individuals raised by the second keyword of this research – China's EV development.

EV development is a significant step the Chinese government takes to transform how automobiles, a ubiquitous tool that meets people's essential mobility needs are powered – from

burning fossil fuels to consuming the presumed cleaner electricity. Transportation constitutes an essential part of how individuals consume energy to meet their daily needs. Automobiles meet people's basic mobility needs. They are, as will be examined in detail in Chapter 4, also a source of protection, autonomy, and dignity required in the broad human security narrative for a fulfilled life. People's lives will be profoundly impacted by the new automobility option in terms of how their utility and psychological needs are met. This is indicated in various public concerns regarding EV development spotted in Chinese society. One example is the unreliable performance of EVs in extreme weather conditions due to the temperature sensitivity of EV batteries, which may negatively impact people's perception of the cars' protection features. The broad school of human security demonstrates that information from different, often ignored angles can be gained with the broad emancipatory approach, which will help reach the human security framework's full potential by recognising the root causes and mechanisms of people sensing insecurities. Instead of the "immediate necessity for intervention capability" of the state emphasised by the narrow school, the broad approach pays more attention to "long-term strategic planning and investing for sustainable and secure development". (Liotta & Owen, 2006, p. 43) Meanwhile, it accepts that security can be personal feelings rather than the prerogative of the state or something existential. Compared with the narrow school that focuses on physical violence, the broad human security approach provides an ideal tool to capture more details, including subjective feelings and psychological factors, of how human lives are profoundly changed by the EV development in the Chinese context, which, as will be explained in Chapter 3, is essential for the sustainability of the industry and the attainment of accompanied strategic goals.

The analysis above serves as a short introduction to the case. Briefly, it explains why the broad approach provides a better lens to look at the human security impacts of China's EV development than the narrow approach. As noted in the Introduction chapter, Chapter 2 and Chapter 3 of this research deal with the motivations of combining the two keywords together. Chapter 3 will focus on the case of China's EV development and explain from an empirical perspective why the broad human security approach is ideal for exploring the development and its human security implications. This chapter, instead, pays more attention to the theoretical framework of human security, the gaps existing in the current human security literature and, more importantly, how the case of China's EV development may contribute to the broad understanding of human security, which will constitute major theoretical contributions of this

research.

Before delving into the gaps in the existing human security literature, it is necessary to proceed further to examine the current understanding of the broad approach. The introduction of the UNDP human security approach marks its official appearance as a response to the limitations of traditional state-based security. The broad human security approach is believed to draw upon the original UNDP formulation of human security (Krause, 2007, p. 4). It sets forward the agenda to broaden the scope of global security to include critical and pervasive threats to people's survival, livelihood, and dignity. The three pillars of the conceptualisation, *freedom from fear*, *freedom from want*, and *freedom to live in dignity*, cover issues related to almost every aspect of human life and welfare. The UNDP framework provides a representative lens to understand what a broad approach has to offer.

As a broad approach, UNDP human security is not dedicated to research on physical violence. "[h]uman security relates to much more than security from violence and crime." (UNDP, 1994, p. 2). "Not only reports on violence can use the human security approach." (p. 3) It equally considers people's "civil, political, economic, social and cultural" concerns. (UNGA, 2012) It is about protecting values that people cherish. As a normative human-centric approach with an aim to create an environment where people can live "in freedom and dignity, free from poverty and despair" (UNGA, 2012), the UNDP definition of human security argues for the expansion of the scope of global security to include seven clusters of threats which cover nearly all areas of human livelihood: "economic security, food security, health security, environmental security, personal security, community security, and political security". (UNDP, 1994, pp. 24-25) Later, UNDP itself emphasised that "this list is neither comprehensive nor definitive". (Gomez & Gasper, 2013, p. 2) "Human security is a flexible approach and can be tailored to different contexts and topics, according to the specific context." (Gomez & Gasper, 2013, p. 2) There is a list of supporting concepts provided by the UNDP Human Development Report Office as other recognised securities, such as water security and relevant issues like social exclusion, modernity, and transition. (Gomez, et al., 2013, p. 64) Instead of limiting its focus to individuals in the direct line of physical violence, other considerations, such as human livelihoods, well-being and dignity, are all covered in its agenda as universal and indivisible components.

In exploring what a broad UNDP framework entails, it is interesting to notice that human-related energy issues have not attracted enough attention within such a comprehensive, all-

inclusive approach. (Karlsson-Vinkhuyzen & Jollands, 2013) Energy is needed for individual survival. Access to energy services, including services to meet people's mobility needs, is a prerequisite of human development. "With energy services key to both modern economies and post-modern lifestyles, energy security is paramount to human security." (Sovacool & Mukherjee, 2011, p. 5343) The extensive use of energy is explicitly linked to nearly all dimensions covered under the original UNDP definition of human security. For example, environmental security is threatened by the burning of fossil fuels, which is the primary source of greenhouse gas and other air pollutants. It also affects health security negatively, such as respiratory and cardiovascular diseases caused by air pollution. (Pablo-Romero et al., 2016, p. 73) Economic security is inseparable from access to sufficient energy resources and energy-related services. (Pablo-Romero et al., 2016) The importance of energy can never be over-emphasised in human lives. However, it was not included in the 1994 UNDP report. It is also generally untouched in the academic literature on human security. (Karlsson-Vinkhuyzen & Jollands, 2013, p. 509)

This argument aligns with the observation made from a broader perspective of energy scholarship that social science is "underutilised and perhaps underappreciated in contemporary energy studies research". (Sovacool, 2014, p. 1). Human-centred methods, despite considered essential for capturing the human dimensions of energy use and uncovering the multidimensional role played by attitudes, habits, and experience in its shaping, are underrepresented in energy research: "Of the 12.6 percent of articles that reported using "human-centred" research methods, these were dominated by surveys (7.8 percent), with far fewer studies utilising field research, research interviews, or focus groups." (Sovacool, 2014, p. 11) Urry (2014, p. 6) also argued that social theory has "insufficiently explored these [energy] systems that energise societies and engender different habits and practices".

One explanation – "the entrapment of energy policymaking within the paradigm of national security" - has been given for the invisibility of energy in the academic literature on human security. (Karlsson-Vinkhuyzen & Jollands, 2013, p. 508) As will be explained in Section 2.3 of this chapter, energy is a notion closely connected to state security. "Energy security is not just a matter of energy; it is about how energy affects national security." (Hillebrand, 2016) The overemphasis on state-level energy security partly explains why energy issues have not caught the attention of human security scholars despite their irreplaceable role in people's everyday lives. Another important reason that is rarely discussed may be the lack of a

comprehensive understanding of what the UNDP human security framework entails. In this sense, the next section will proceed with an in-depth conceptual analysis of UNDP human security, focusing on what has been missing in its current understanding and application. It will explain why energy-related human security issues have been less discussed by demonstrating that existing literature has not fully reflected the potential of the broad human security approach. The gaps identified in the literature will, in turn, provide an opportunity for this research to contribute to alternative interpretations of the broad approach.

2.2 UNDP human security – for every society and everyone

The conceptual analysis of UNDP human security revolves around a string of questions, such as the definition(s) of human security, its measurement, its relationship with national security, and the correct "list" of core issues. (Bosold, 2012, p. 29) Baldwin's conceptual analysis of security helps do the job. His work has shed crucial light on how security can be understood and analysed. According to Baldwin (1997, p. 23), economic security, environmental security and military security are not fundamentally different concepts. They are just different forms of the same social phenomenon – security. In this sense, a general set of specifications can be applied in the conceptual analysis of all specific forms of security, amongst which human security is undoubtedly included. Based on the understanding of security as 'a low probability of damage to acquired values' (Baldwin, 1997, p. 13), Baldwin identified two most general specifications of defining security, namely *security for whom* and *security for which value*, along with some other specifications, such as *from what threats* and *by what means*, to better frame specific security issues.

Based on Baldwin's framework of security analysis, this chapter will elaborate on the UNDP human security conceptualisation from the following perspectives in order to provide a fine-grained picture of the scope of the broad approach: *Security for whom? Security for what value and from what threats? and Security by what means?* By identifying the often ignored "people", values and threats, and alternative means to security covered within the conceptual framework, and how they have been poorly grasped in the existing literature, this section will provide an

alternative explanation of why energy, despite its significance in meeting people's daily needs, has not been a major topic within the human security framework. More importantly, the conceptual analysis will inform the missing part in the current application of the broad approach, which will lay the foundation for the next section, where this chapter will explain why energy, China's EV development in this case, constitutes an ideal perspective to understand and fill the gaps.

2.2.1 Security for whom?

The shift of focus from national to human security means that the answer to the question of security for whom has clearly changed from the state to the individual. Even though human security was introduced as a concept that is universally applicable to each individual, as has been clarified that "[h]uman security is relevant to people everywhere, in rich nations and in poor" (UNDP, 1994, p. 3), the focus has been on the most vulnerable. It, in most cases, is articulated underscoring the most vulnerable. "…all individuals, in particular vulnerable people, are entitled to freedom from fear and freedom from want…" (UNGA, 2005, p. 31) Expressions such as "vulnerable groups such as women and children" can be frequently seen in human security literature. (MacFarlane, 2004, p. 368) Translating the human security concept into practical action provides "concrete and sustainable benefits to vulnerable people and communities threatened in their survival, livelihood and dignity". (United Nations Trust Fund for Human Security, 2021). The tendency to presume that "human-centred vulnerabilities" are often present "only in the context of non-traditional challenges for developing regions" also exists in academia. (Liotta, 2002, p. 473) It is often ignored that all societies have security concerns as citizens in all states face various threats in their everyday life, no matter how advanced the state is.

The special attention given to the most vulnerable in the UNDP concept limits the scope of "human" with security needs. It strengthens the impression that it is a framework dedicated to analysing the most fragile places in the world.[2] Most attention, if not all, has been given to the

[2] The recent work of Newman (2021) challenged this typical setting of human security research in the "fragile" Global South by bringing the empirical focus upon the economically and militarily strong states (US and UK in particular) in the human security analysis of the impacts of Covid-19. His research shows that the US and the UK,

"most obvious" vulnerable populations whose sufferings can easily be seen and imagined. This is clearly shown in the initiatives of international organisations that have taken the lead in integrating the human security approach. For example, UNDP has initiated human security projects in conflict-prone societies. The UN High Commission for Refugees has also engaged with the human security framework aiming to prioritise the protection of forcibly displaced peoples. (Newman, 2021, pp. 3-4) Take energy as an example. Amongst the limited human energy research, the focus has mostly been on the most vulnerable groups who live in the condition of regular energy shortages and struggle with maintaining basic energy needs and, in general, survival needs, indicating that energy security threats are the concerns limited to people living in marginalised communities.[3] Most narratives around energy poverty are linked to less developed countries, especially those in Asia and Sub-Saharan Africa, as 95% of those without access to modern energy services live in these regions. (González-Eguino, 2015, p. 380)

The tendency to locate human security threats only in the developing world identified in the existing research[4] reflects the belief amongst human security scholars in "a division based on countries that can 'act' (hence project their power) in other spheres, and those that are mere recipients of such benevolence/malevolence". (Tadjbakhsh, 2013, p. 47) Human security evolved out of the increasing attention to the development of the global South (Christie & Acharya, 2008, p. 5) and the need to mend the North/South divide. However, the narrow reading of human security as the security of the most vulnerable has deepened the divide and incurred criticisms that the approach opens to co-option by political elites. (Chandler, 2008, p. 431) Assuming that "deprived people in the 'developing' world are helpless victims" (Newman, 2021, p. 6), human security is criticised as "part of a 'West against the Rest' effort to impose

which enjoy the military capability to reach a high level of security in the conventional military term, performed weakly in providing human security against Covid-19.

[3] There are exceptions. The existing literature also notes situations where people in developed countries are subject to energy exploitation. For example, Johannes Kester (2017) illustrated and reflected on how gasquakes caused by gas extraction have threatened the local population in the Netherlands. However, the logic is the same as the research demonstrates a narrow understanding of human security with a focus on the survival needs of a specific group of the most vulnerable.

[4] One example is the link identified in the UK's National Security Strategy and Strategic Defence and Security Review of 2015 (HM Government, 2015, p. 66) between epidemics and developing countries: "We will also invest in new, large-scale research and development to combat the world's deadliest diseases. These include diseases with epidemic potential and those which affect the lives and livelihoods of millions in developing countries, building on the UK's major commitment to tackle malaria, and neglected tropical diseases over the last Parliament."

individualistic and culturally inappropriate Western notions of human rights and humanitarian intervention on the developing world". (Mack, 2004, p. 366) It is criticised as providing the normative rationale for "liberal intervention" aiming to 'save' the disadvantaged. (Newman, 2021, p. 6)

One way to defend the human security approach is to realise that the concept does not have such limitations. Threats to human security can exist at all levels of development. The human security approach is flexible and can be tailored to different contexts. (Gómez & Gasper, 2013, p. 2) Affluent societies are not immune to "real and growing" human insecurities, even though the threats they face may demonstrate in slightly different ways. (UNDP, 1994, p.3) Regarding individual energy security, energy poverty takes on various forms. (Kester, 2018, p. 24) Besides the energy security concerns of availability and access to modern electricity and cooking equipment discussed mainly in relation to individuals in underdeveloped countries, energy poverty comes in different shapes, such as affordability of energy services in developed western countries and energy justice at a more abstract and global level. (Kester, 2018, pp. 24-25) According to conservative estimates, more than 50 million households in the European Union face difficulties paying utility bills on time. (Filčák & Živčič, 2017) Apart from energy bills, people in industrialised countries also face other problems in their daily lives, such as insufficient health care and increasing food prices. (Filčák & Živčič, 2017) A comprehensive understanding of the emancipatory approach of the UNDP framework that can be applied universally cannot be achieved without bearing this in mind.

2.2.2 Security for what values and from what threats?

Development has been given special attention and seen as the solution to human insecurities since the introduction of the human security concept, as indicated in the 1994 HDR: "The search for human security lies in development, not in arms." (UNDP, 1994, p.1) A sustainable development paradigm has been established in pursuing human security:

> A new development paradigm is needed that puts people at the centre of development, regards economic growth as a means and not an end, protects the life opportunities of future generations as well as the present generations and respects the natural systems on which all

> life depends. Such a development paradigm enables all individuals to fully enlarge their human capabilities and put those capabilities to their best use in all economic, social, cultural, and political fields. (UNDP, 1994, p. 4)

Realising that future conflicts may often result from "the lack of socio-economic progress" (UNDP, 1994, p. 2), the development paradigm of human security regards economic growth as an effective means of reducing human insecurity. Less attention, however, is given to the impacts of the development in the name of enhancing human security on human security. One often neglected category of security threats in the application of the UNDP approach are those that "are not yet widely recognised, but where evidence suggests they need to be taken seriously". (Gómez & Gasper, 2013, p. 4) There has already been a long list of established major threats to all prioritised values of human beings available for human security researchers to focus on. However, along with the advancement of new technologies, new opportunities and challenges emerge, which will add to the existing list by including new categories of threats.

These threats usually emerge in well-developed regions in the face of the lasted technological transformation. As noted earlier, special attention has been given to the most deprived, even though human security was introduced as a concept applicable to each individual. Security, in the broader sense, is a common concern for all societies, although its contents and characters are highly relative to the context. (Gomez et al., 2013, p. 9) All societies at different levels of development have their specific human security concerns.

A typical example of the emerging threats brought by the new development is the energy transition, which is believed to be a responsible step to "protect the options of the unborn generation…[and] not run down the natural resource base needed for sustainable development in the future" so that all generations, both present and future, are able to "make the best use of their potential capabilities". (UNDP, 1994, p. 4) The process, however, is given less attention in terms of how people's lives are impacted during the transition process. The burning of fossil fuels has long been having negative impacts on people's health. Renewable energy development, if managed well, can pose minimal health risks. Some of the threats imposed on human health will surely diminish. It can yield new social and economic benefits. However, the development of renewable energy is not as friendly toward the environment and human health as it is believed to be. (Tajne, 2015) The dams constructed for harnessing hydropower tend to influence the flow of rivers greatly. It causes flooding, which can result in the destruction of agricultural land, forest, and wildlife. It can also lead to the forcible removal of

human settlements. An estimated 80 million people have been displaced by dam projects worldwide. Evidence shows that those affected tend to become impoverished and marginalised, and these impacts are long-lasting. (IDMC, 2017) The building and operation of solar power facilities are closely associated with land use, water use, habitat loss, and the use of harmful materials in the manufacturing of solar panels. (Tajne, 2015)

The development of EVs is a crucial measure endowed by governments in the transition of the automobile industry and bolstered as a necessary step to fight climate change. (IEA, 2016) How exactly people's lives will be impacted by this transformation of automobility, which is closely connected to people's daily lives, has not been given enough attention. As noted earlier, energy issues, in general, have been less discussed in the human security narrative. The world is now undergoing an energy transformation that profoundly touches people's daily lives. How people access energy to meet their essential needs, such as mobility needs, will be profoundly impacted as the energy services available that are more environmentally friendly may cause unexpected disruptions in everyday life. Various public concerns regarding EV development can be spotted in Chinese society, such as the unreliable performance of the car in extreme weather conditions, which may negatively impact how people's basic mobility needs are met. The UNDP approach reminds researchers and policymakers that the question of what the most relevant threats are and will be at a particular time and place must be constantly asked. For these emerging threats that are not well recognised but with the potential to pose harm to human security, awareness should be raised, and actions should be motivated. (Gomez & Gasper, 2013, p. 4)

2.2.3 Security by what means?

The operational process of the UNDP human security approach depends heavily on states, even though it calls for collective efforts and collaboration amongst governments, institutions, and civil societies. The broad UNDP approach "explores using both empowerment and protection to tackle specific threats to people's lives." (Gomez & Gasper, 2013, p. 3) It considers multiple security providers, and many actors, including individuals, businesses, communities, and

international organisations, can and should play a part.[5] It is important to note, however, that the state – in league with businesses, NGOs, and civil society groups – is still seen as the most effective and legitimate provider of human security. (Sen, 2000) The 2012 General Assembly Resolution stresses the role of member states in identifying and addressing widespread and cross-cutting human security challenges. (UNGA, 2012) According to the Resolution, "[g]overnments retain the primary role and responsibility for ensuring the survival, livelihood, and dignity of their citizens." Other possible agencies are mentioned in the resolution as well. However, the role of the international community is "to complement and provide the necessary support to Governments, upon their request, so as to strengthen their capacity to respond to current and emerging threats". (UNGA, 2012) It is made clear in the UN approach that human security is by no means on the same level as national security. It "does not replace State security". (UNGA, 2012) Instead, human security "complement" human security. (UNCHS, 2003, p. 2) The implementation of human security measures, as a result, is based on "national ownership". It is recognised that political, economic, and social conditions vary significantly "across and within countries". Strengthening human security needs "national solutions which are compatible with local realities". (UNGA, 2012) It is the job of states to take measures to improve the human security condition within its border, even though the situation and challenges facing the state can be very different amongst areas and communities.

The state-led nature of the UNDP human security [6] is to be expected, given that it is proposed by the UN, an international organisation whose only legitimate members are nation states rather than NGOs, donor agencies, human rights groups, transnational corporations, or individuals. (Axworthy, 2004, p. 247) According to the UN Charter, its central purpose is to ensure the

[5] One example that emphasises individual agency is the 2003 Latvia Human Development Report (HDR), which introduced the concept of securitability, namely, "the ability to avoid insecure situations and to retain a sense of security when such situations do occur, as well as the ability to re-establish one's security and sense of security when these have been compromised", along with some securitability factors, some internal traits of individuals and external structural conditions to enhance human security. (UNDP Latvia, 2003, p. 15)

[6] The state-driven nature of the UN human security is also demonstrated in the establishment of essential mechanisms existing to facilitate the operational agendas related to the fulfilment of human security, such as the *United Nations Trust Fund for Human Security* and *Human Security Network*. The establishment of the *UN Trust Fund for Human Security* in New York in 1999 was driven by an initial partnership between the Japanese government and the United Nations Secretariat. It was activated by the Japanese government's donation of 500 million Yen. (Edmundo, 2020, p. 40) The *Human Security Network* originally grew out of a bilateral arrangement between Canada and Norway in 1998 as an effort to generate consensus on a theoretical framework and push forward an action agenda for human security. (Julio & Brauch, 2009, pp. 991-2) Since then, a group of like-minded countries have joined the network and have been working on bringing "international attention to emerging threats to people's safety, security and well-being". (Julio & Brauch, 2009, p.992)

"territorial integrity and political independence" of its member states, which is a tribute to the sovereignty norm. (Axworthy, 2004, p. 247)

The state-led nature of the UNDP approach is, however, controversial as it constitutes a major reason for agency-related criticisms. "The challenge is how to interpret and apply this inspirational broad idea in practice." (Gomez et al., 2013, p. 10) Even though the approach proposes a normative emancipatory world and helps identify threats facing human beings, the power and resources to deal with the threats are still in the hands of the government and are used based on national interests. There is a lack of other powerful agents to fulfil the vision proposed by the approach. How the security of individuals will be achieved are much less clear. Newman (2021, p. 4) points out the "central controversy" in the human security debate. He argues that the primary role and responsibility retained for governments no longer reflect the original UN agenda that acknowledges states may be the primary threats to human security. Its state-driven nature, along with the overemphasis on the most vulnerable, as noted earlier, has incurred criticisms that the human security approach reinforces hegemonic international liberalism as it does not directly engage with the contestation of power relations. (Chandler, 2008, p. 431) Since it failed to provide an alternative "agent" to provide security, the human security approach is open to be co-opted by political elites and institutions to strengthen the current structure. It has therefore been criticised as "playing up to realist calculations of self-interest instead of posing an ethical normative challenge". (Chandler, 2008, p. 431)

Human security as a concept rose within the bigger picture of the emergence and burgeoning of Critical Security Studies (CSS), which is "inherently and intrinsically suspicious" of states being the solution to human security issues. (Newman, 2010, p. 87)[7] "The arguments for a

[7] Human security is closely intertwined with critical approaches to security studies. One piece of evidence of the burgeoning of CSS during much of the 1990s and early 2000s is the rise of the concept and approach of human security. Although the Welsh School, the first generation of emancipatory security theorists, did not explicitly embrace human beings as the primary referent object, it upheld the emancipatory understanding of security by focusing on individuals and communities. (Grenfell & James, 2008; Bastian, 2004) Critical approach development during this period resulted in the implementation of emancipatory policy practices, which gained more attention and resources for human-related issues. (Roberts, 2008; Elbe, 2010). At the time of the reconceptualisation of security and reorientation of western foreign policymaking after the end of the cold war, human security as a concept has been utilised by international agencies, NGOs, and some nation-states as they proclaim emancipatory goals. Significant achievement in global norm-making has been made under the rubric of human security, such as the signing of the Anti-Personnel Landmines Convention, the establishment of the International Criminal Court (Paris, 2001, p. 88) and the introduction of the Responsibility to Protect (R2P). These humanitarian developments have been used as evidence to show the importance of CSS and the transition towards human beings as the referent object in policymaking. (Hynek & Chandler, 2013, pp. 50-51) The development of CSS gave rise to "human security as a concept, discourse and practice". (Hynek & Chandler, 2013, p. 50) In turn, the application of the

human-centric approach to security in the IR/SS literature can in part be located within 'critical security' studies." (Kerr, 2003, p. 7) CSS scholars reject states as the only legitimate subjects of security studies and embrace an emancipatory articulation of security. (Hynek & Chandler, 2013, pp. 49-50) This posits a radical shift in the understanding of security from based only on the notion of national security to including more fundamental elements, that is, the security of individuals or communities. Being able to provide an alternative goal for the government to secure the people, CSS is, however, less clear regarding how the transformation can be achieved. The critical approach is more of a normative idea of how an emancipatory and liberalised world should be than based on analysing and solving real-life struggles. The very fact that states are the principal providers of people-centred security demonstrates the limits of CSS's transformative effects. (Hynek & Chandler, 2013, p. 53)

The human security approach recognises that national security does not necessarily ensure the security of its citizens. States regimes are sometimes even the cause of insecurities of its citizens, such as political violence. This research does not intend to challenge the very logic and conventional understanding of security that treats the state as "the central institution of political life" (Krause, 2007, p. 7) [8] nor does it question the significance argued by narrow school scholars of "the construction of strong and legitimate state". (Krause, 2007, p. 18) It argues, instead, that the human security approach opens up the possibility for rethinking security and alternative responses more appropriate to new security threats different from the conventional ones that are "exclusionary, militarised and linked to 'emergency measures'". (Krause, 2007, p. 6) "[Human security] has provided a framework for state and non-state actors that are committed to human-centred policies and to addressing the human impacts of insecurity." (Newman, 2021, p. 3) It allows the identification of new actors to exercise their agency and works towards multi-stakeholder approaches and solutions to human insecurities. (McIntosh & Alan, 2017) This is in line with the Welsh school standpoint that, instead of denying states are currently the actor best endowed to provide security, requires more attention paid to security agents other than the state. (Bilgin, 1999, p. 38) "Old and new actors alike should endeavour to meet the new agendas via alternative practices." (Bilgin, 1999, p. 38)

human security approach in policymaking and humanitarian development is strong evidence for the theoretical and political significance of the CSS.

[8] It is, however, important to keep in mind that the framing of human security around state actors can be limiting. Since the state is embedded in the structural conditions from which insecurities arise, state elites cannot be truly committed to promoting human security. (Newman, 2021, p. 5)

While recognising the power differentials between actors, with the state being the most powerful, the human security approach attracts attention to exploring the possibility of other actors as agents. The broadness of the human security framework is not only demonstrated in the people and threats covered but also makes a broad understanding of the security agency incorporating non-state actors necessary.

To sum up, the UNDP approach to human security is a strong response to the traditional notion of security. It reflects a growing recognition that "the protection of people must be a principal concern". (Axworthy, 2001, p. 19) Even though it gives priorities to the most vulnerable, it can be extended to cover pressing and potential threats facing every society and every individual at every stage of development. As the world develops and new technologies are introduced, new opportunities and challenges will emerge, which will add to the existing list as new categories of threats that deserve the attention of human security scholars will be included. Instead of focusing on explaining or predicting the behaviour of states, the human security approach concerns what security should look like in the context of everyday life and "making value judgments on whether this behaviour is morally acceptable" according to the outcomes for individuals and communities. (Tadjbakhsh, 2013, pp. 44-5) While human empowerment and collaborative efforts amongst international communities, governments, institutions, and civil societies are encouraged, the UNDP human security approach is criticised for its state-driven nature. The dominant role of states as major providers of security remain unabated. However, the broadness of human security can also be interpreted as the recognition, despite the dominant role of states, of other possible non-state agents who may play positive roles in facing the new human security challenges in the context of fast world development.

The lack of a comprehensive understanding of what the UNDP human security framework provides in the existing literature partly explains the limited adoption of the human security approach in energy-related areas, including the latest energy technology application in relatively advanced regions. Bearing in mind this obstacle to the development of the broad human security agenda, this research will take the energy transition, focusing on China's EV development, as a lens to explore the underexplored potential of the human security agenda in the emerging development areas. The transition of the automobile sector in a low-carbon, efficient and environmentally benign way is depicted as a major solution to the energy challenges that "the future of human prosperity depends on". (IEA, 2008, p. 37) Challenges brought to people's lives during the transition, however, have been given less attention. Unlike

other energy transition strategies, such as the development of wind power, that do not involve much in the everyday life of ordinary people, the automobile industry transformation suggests that the lives of many people, not limited to the most vulnerable, will be impacted in terms of how their essential mobility needs, and accompanying psychological security needs, are met.

2.3 Energy security and human security in China

As noted at the beginning of this chapter, Chapter 2 and Chapter 3 aim to explain the motivations for bringing together the two keywords - human security and China's EV development. The last section of this chapter will explain why China's EV development, a significant step in the country's energy transition, may well constitute an ideal case to develop a more comprehensive understanding of the broad human security approach. Before delving into it in Section 2.4, two things need to be clarified in this section to better situate this research within the existing literature. First, it is worthwhile to illustrate more about the unique role of energy in understanding human security. For this purpose, a literature review of energy security will be provided in Section 2.3.1 to demonstrate that energy security provides a good lens to examine the relationship between national security and individual security thanks to its traditional state-centric understanding, its highly context-dependent nature and its essential role in everyday life of the people that, as noted in section 2.1, is currently underrepresented in the energy security research. Second, since the Chinese context is very different from the West, where the human security approach was introduced, this section will also incorporate an overview of the meanings of and approaches to human security in China. It will explain how human security is exercised in the Chinese context, which will offer the political background against which this research is conducted. It will also lay the theoretical groundwork to examine how the unique case of China may contribute to the theorisation and understanding of the broad human security approach.

2.3.1 Energy security

2.3.1.1 State-centrism

Energy security has, to a large extent, been narrowly constructed and approached as national security with a preponderance of focus on oil and gas supply. (Chester, 2010, p. 889) Due in large part to its singular importance to industrial and military activities, energy security has proved particularly wedded to the traditional security architecture. (Simpson, 2013, p. 9) It is shown in energy security conceptualisation and approaches, where the discussion of what constitutes energy security, potential threats, and its policy relevance is mainly conducted on a state level. Two dominant readings in the energy security discussion have been identified in the existing literature – "a geopolitical interpretation of national states caught in a zero-sum game of conflict over the last remaining scarce resources and …a neo-liberal market interpretation…that puts its faith in energy markets to distribute resources and develop substitutes". (Kester, 2018, p. 29) Despite their differences in core assumptions on such issues as conflict, scarcity, control, and potential technological development, "the capital-intensive and centralised decision-making tendencies behind both of them have historically implied that energy security is a concern for national governments." (Kester, 2018, p. 30) "It is 'consuming countries' that are ultimately 'vulnerable' … and states, together with industry, are key actors to minimise risks of supply disruptions and their possible negative impact on the global economy." (Nyman, 2013, p. 37) A more critical perspective on energy security has been argued by some scholars realising that treating or framing energy as a security concern is problematic and has hindered the efforts to grasp its full picture. The referent object adopted in their studies, however, is still a state or a region. (Phillips, 2013; Nyman, 2014; Nyman, 2018; Toke & Vezirgiannidou, 2013; Trombetta, 2018) After reviewing the wide-ranging and proliferating concerns captured within the energy security scholarship, Kester (2018, p. 30) concludes that even though some evolutions of the energy security conception, such as the complexity of sustainability and the attempted downward shifting of the referent object from the state to the individual have broadened and deepened the understanding of energy security, it has to be admitted that "they are not read, discussed and rated with equal importance".

2.3.1.2 Context-dependence

Apart from state-centrism, another characteristic of energy security conception widely discussed in the literature is its dependence on the context. As Chester (2010, p. 893) puts it,

> The conceptualisation of energy security at a global level compared to regional, national, producer or consumer levels may contain similar notions of availability, adequacy, affordability, and sustainability. However, the specificities of each will understandably differ at any point in time. All hold equal validity, but each will express the concept of energy security in their respective sphere.

The concept's "polysemic" nature makes it "capable of holding multiple dimensions and taking on different specificities depending on the country (or continent), timeframe or energy source to which it is applied." (Kruyt et al., 2009, p. 2166; Chester, 2010, p. 887) Some scholars have echoed the argument. "Energy security is a concept notorious for its vague and slippery nature, no less so because it is bound to mean different things at different times to different actors within the international energy system." (Isbell, 2007, p. 3) It is, therefore, nearly impossible to capture all aspects involving different histories and materialities in one energy security definition accepted by all. (Hildyard et al., 2012, p. 6; Alhajji, 2007) Ciuta (2010, pp. 123-124) goes further by calling energy security "an inauspicious terrain for security theory". Ciuta uses the term banality as the ubiquity and totality of energy have striped security of its bounded domain of meaning and practice and rendered security ubiquitous, politically unexceptional, total, and vacuous. (Ciuta, 2010, pp. 123-124)

The multi-faceted nature of energy security, holding different meanings for different stakeholders, opens up the chances for its conception to be manipulated for certain political purposes. Instead of some "natural state of affairs", energy security is constructed to be geopolitical and state-centric by such actors as political elites, (insurance) companies, academia (including observing energy security scholars) and the public. (Kester, 2018, p. 98) [9] "… the

[9] For a detailed performative reading of energy security and the processes and conditions behind securing energy, see Kester (2018).

presence of different actors with different interests…creates strong pushes and pulls on all energy security policies… What is significant in this respect is the relative positions of power of these actors, which they use to securitise energy in ways that generate preferred policy outputs." (Ciuta, 2010, p. 133) This is exemplified by the negligence of the individual dimension in the energy security inquiry due to the preponderance of focus on national security. The state-centrism of energy security has, in turn, inspired scholars like Hildyard et al. (2012, pp. 63-69) to distinguish the upper-case Energy Security that "matters particularly to ruling elites" and the lower-case energy security of the commons concerning all.

2.3.1.3 Human-centric energy security

Energy is not just something that keeps people alive. It is involved in every single aspect of human life and well-being. Amongst the limited attempts to explore human energy concerns, some analyses reflect the strong connection between energy issues and human security. Adopting a chronological approach, Rüdiger Graf (2010) traced how the concepts of energy security have been evolving in a similar fashion along with the broadening and deepening process of the security conception.[10] Certain respects of the discussion on energy security have become elements of human security consideration. Recognising that lack of resources, the ecological consequences of the burning of fossil fuels, and even potential future energy wars may threaten both the security of living conditions in Western industrialised countries and the lives of people in the least developed countries, Graf argued that the changing energy scene might have consequences for human security. (Graf, p. 344) Similarly, Shane Mulligan (2011) argued for the necessity to analyse energy issues from the perspective of human welfare because of the strong implications of the oil peak on human life. By illustrating three security themes concerning energy – freedom, life, and death,[11] Mulligan's analysis proved the

[10] Graf used the example of oil to illustrate the evolution. Oil was first treated as a strategic resource necessary to fuel the war effort. Energy supply was perceived as a matter of state security, closely connected to military capacity. (Graf, 2010, p. 344) Due to the increasing importance of oil in modern industrialised economies, the notion of energy security changed over time. It gradually widened and became the foundation of economic, social, and political life in Western industrialised countries. (Graf, p. 344-5)

[11] The availability of fossil energy frees many people from the burdens of providing human needs through physical human labour. It allows people to live a life of abundance like never before. As the oil peak impends, one related question is "whether governing institutions will be compelled to implement a range of coercive measures, and to curtail personal freedoms, in the interests of maintaining some degree of order under ecological constraints". (Mulligan, p. 641) This leads to another dimension of the relationship between the oil peak and human security: uncertainty. It is widely held that energy descent poses profound threats to maintaining complex

inseparability of energy and human security and demonstrated that energy descent could severely threaten human security and welfare. (Mulligan, p. 640-5)

Ciuta (2010, p. 132, p. 135) identified three logics of energy security. Apart from the war logic, the other two logics, subsistence ("the need for energy is driven… by the functional demands of various sectors of activity") and totality ("the potential of energy security to percolate down through to the most minute, banal and intimate aspects of our lives"), indicate the necessity of energy for social life as there is not one aspect of life that is not in some way enabled by the extraction, distribution and consumption of energy resources". (Kester, 2018, p. 48) To a certain extent, scholars like Ciuta draw attention to the much-neglected individual dimension of energy security compared with the national security considerations. Likewise, the traditional state-centric understanding of energy security has been questioned by scholars like Karlsson-Vinkhuyzen and Jollands (2013), who realise that conventional approaches are insufficient in solving the pressing energy security issues facing us as human beings. The state-centric approach makes the individual invisible, which is a cause of insecurity. Some energy policies of making energy supplies more secure ended up "triggering a cascade of new insecurities for millions of people – whether as a result of the everyday violence that frequently accompanies the development of frontier oil and gas reserves or because the pursuit of 'energy security' through market-based policies denies many people access to the energy produced". (Hildyard et al. 2012, p. 5)

Among the limited literature on energy security within the human security narrative, Kester's work on the Dutch gasquake debate offers an example of the dynamic relationship between energy security on the state and individual levels. (Kester, 2017) It illustrates a security debate that puts a central energy security concept, security of supply, within the context of human security arguments. It provides a performative reading of energy security in terms of how the Dutch security of supply understanding has been constantly influenced and shaped by the resistance it faces from the safety concerns of the local population. (Kester, 2017, p. 13; p. 18) As discussed in the following chapter, the complicated relationship between energy security on the state and individual levels in China's EV development context resonates with points made in Kester (2017). A parallel analysis will be conducted in the discussion chapter in terms

systems like the state and global commerce. It may even lead to some form of collapse in these systems or in 'civilisation' more generally. However, the specific effects of these collapses are an open question and hard to envisage. Amongst all possible effects, the most profound one is "the epistemic 'void' represented by (the fear of) death". (Mulligan, p. 644)

of how the construction of energy security differs in the two scenarios, which will shed some light on alternative understandings of human security constructed within the Chinese context.

This section on energy security covers the two main characteristics of the current energy security discussion, namely state-centrism and high context-dependence, which are highly relevant to this human energy security inquiry and will be further illustrated within the Chinese context. This section also discussed the existing human energy security literature that demonstrated the unique role of energy security on both state and individual levels and provided more evidence to argue that the individual dimension of energy security is much neglected. The next chapter will put the statist understanding of energy security into China's case by examining the strategic role played by the Chinese EV industry in ensuring the country's energy supply by reducing its imported oil dependence. Meanwhile, the polysemic nature of energy security discussed highlights the importance of a contextual understanding of energy security. (Kester, 2017, p. 18) It acts as a reminder of the necessity of studying the use of security and threat images in their wider social and political context, especially how security practices are used to make sense of energy security. (Kester, 2017, p. 18) In this sense, it is necessary for this human energy security research to consider how security is understood and approached in China, where the analysis takes place. Since it was introduced in the developed western world, the concept of human security, despite its Asian pedigree (Acharya, 2001, p. 444), finds different expressions. The contextualisation of human security in China deserves close attention in order to better utilise the analytical tool of human security to understand the energy security of ordinary Chinese people and the impacts of EV development in the context of this research specifically.

2.3.2 Human security in China

Before jumping into human security studied and analysed in the Chinese context, it is necessary to note that scholars like Acharya (2001, 2002) and Zhang and Zheng (2013) have explored the differences in understandings and expressions of human security between the East and the West. "The different interpretations of human security are not necessarily incompatible, but they do create ground for controversy and suspicion in multilateral settings" (Acharya, 2001, pp. 442-443). This section will start with an overview of the major characteristics of the meanings of and approaches to human security in Asia in relation to those in Western countries. It will be

followed by a close-up look at the academic work on human security in China, which will pave the way for the analysis of China's energy security strategies and EV development considerations in the next chapter and set the stage for the discussion of the expressions of human security in China through the lens of its EV development in the following chapters.

The "East" (Asia) has been portrayed as a "challenge" to the western idea of human security, given "the East's traditional understandings of security, claims of cultural specificity, and relative abundance of illiberal polities". (Acharya, 2001, p. 443) Despite earlier attempts by Asian governments to broaden the traditional understanding of security as protecting sovereignty and territorial integrity against military threats to introduce notions such as comprehensive security with an intention to horizontally broaden the threat spectrum[12], the focus is still on "what the state should be protected from". (Acharya, 2001, p. 454) There are fundamental differences between the horizontally broadened yet statist security in Asian countries and the human-centric human security advocated by the West. (Acharya, 2001, p. 443) Instead, it reflects certain characteristics of the adoption of human security in the East, the appreciation of which helps grasp the meaning of and approach to human security expressed and implemented in China.

Even though it is an almost impossible task to reach a single set of social values of Asia, which is "the most diverse region in terms of culture, religion, ethnicity and language" with a huge demographic composition of more than 60% of the world population, there are still some commonly accepted "Asian values" such as attachment to the family as an institution, the traditional closeness between the state and the individual, deference to societal interests, respect for the authority, and the value of consensus over confrontation. (Acharya, 2002) These values substantially impact the understanding of human security in the region and find expressions in the characteristics of the Asian agenda of human security regarding whom to protect and who protects. As discussed earlier, despite the promise of providing an alternative to the traditional notion of national security beyond military threats, the Asian version of comprehensive security is fundamentally statist, with military defense as its core component. (Acharya, 2001, p. 452) As discussed earlier, the UNDP human security approach understands

[12] For an introduction to comprehensive security and its comparison with human security, see Acharya (2002). The expressions of comprehensive security in Japan and the Association of Southeast Asian Nations (ASEAN) can be found in Acharya (2001, p. 452)

the human as beyond the most vulnerable to everyone. The human concept can also be understood within the Asian context as both individuals and communities. The distinction between "people" and "individual" is "not unimportant". (Acharya, 2001, p. 449) The Western usage of human security that reflects the individualistic ethos of liberal democracy often competes with the Asian mindset of "society-before-the-self", where the ethos of communitarianism is upheld. Since the goal is to protect the state or society as a collectivity rather than individuals, the predominant role of the state as the security provider remains unchallenged. As discussed in earlier sections, one of the strongest criticisms of the human security approach points to the lack of alternative agency other than the state. The understanding of society as collectivity instead of individuals leads to the argument that the notion of human security is welcomed by some Asian governments as a prop to their cause instead of as a threat to their belief and approach. (Acharya, 2001, pp. 449-450)

The understanding of human security in the region in terms of security agency and the referent object discussed above also finds expression in the Chinese context. As noted earlier in this section, resistance is expected in the acceptance of the western human security idea by some communitarian governments in Asia. This is also acknowledged by Chinese human security scholars as it is assumed that the human security paradigm developed in the West prioritising the safety and welfare of individuals is challenged in China due to its state-centric approaches to international politics and society. (Li & Yu, 2013, p. 15) The prioritisation of national security with the state as the main security provider constitutes the main characteristic of the Chinese conceptualisation of security, given its "historical memory of suffering from foreign invasions over the past two centuries and the ensuing determination to safeguard its sovereignty". (Li & Yu, 2013, p. 16) Even though it is argued that human security remains "largely unclear" in the Chinese context as an intellectual consensus is yet to achieve within the Chinese academia (Li & Yu, 2013, p. 17), the statist mentality of security strongly impacts its understanding of and approach to human security.

The illustration of the Chinese human security approach starts with the interpretation of human. The divergence of emphasis, that is, to understand human as an individual, a specific group within (or even constituting) a sovereign entity or the whole human race, is reflected in the Chinese interpretations of human security. (Li & Yu, 2013, p. 17) Shaped by the group-oriented value systems embedded within Chinese society, human security has been interpreted as "humankind security", referring the humankind as a whole. (Li & Yu, 2013, p. 17) It has also

been translated into ‘people-oriented security’ to coincide with the notion of ‘people-oriented’ development proposed by previous Chinese president Hu Jintao. (Li & Yu, 2013, p. 17) The emphasis on collective unity about security issues in China conflicts with the individualism shaping human security in the West. The collective ethics predominating over individual ethics deeply rooted in the traditional Chinese value system leads to the belief that the individual lives of ordinary people were subjugated to the security and welfare of the whole. (Li & Yu, 2013, p. 27)

This understanding is reflected in the conflation of human security with non-traditional security studies (NTS) in the Chinese context. (Breslin, 2015; Li & Yu, 2013; Zhang & Zheng, 2013) “…China is still calibrating the development of human security within the broader context of non-traditional security and without diminishing the importance of its national security interests in the process.” (Li & Yu, 2013, pp. 20-21) This conflation serves two purposes, which shed some light on the Chinese interpretation of human security regarding who and what is to be protected and how to protect. The first is to allow the human security analysis in China to remain on the state level rather than move down to the individual level. (Breslin, 2015) The clear distinction between human security and NTS lies in the referent object - while the UNDP human security approach aims to extend the scope of security concerns from those facing national sovereignty to those affecting the daily lives of individuals, the focus of NTS is on the new existential challenges, instead of interstate wars, facing the state or the planet. (Breslin, 2015, p. 245) Non-traditional security is more compatible with China’s strategic preference to underscore the primacy of national sovereignty. (Li & Yu, 2013, p. 19) The blurring of the distinction allows the human security discourse in China to restore the state as the referent object while addressing functional and concrete human security challenges within Chinese society. Once the referent object is back to the state, the state becomes absolutely central to the discourse of human security in China. This leads to the other purpose of conflating human security with NTS in China’s security discussion – to stress the state’s role as solely the provider of security rather than potential threats. This, as will be discussed in the following chapters, will find expressions in the case of China’s EV development.

The overview of the understanding of human security in China above provides an important part of the context in which this research is conducted. It will be extended and further discussed in the discussion chapter to illustrate the theoretical contributions of this research. The last

section of this chapter will combine the abovementioned keywords and explain why this research has chosen EV development as a case study in studying human energy security in China.

2.4 Choosing EV development in China as a case study

The latest development in the energy transition is regarded as a missing link in the mainstream energy literature. (Proskuryakova, 2018, p. 207) Key development witnessed in the energy industry during the past decade regarding technological improvements and the acquirement of alternative energy resources is transforming the global energy scenario in the twenty-first century, including the resources available for civil society and how people access energy. Developing relevant technology and alternative resources will surely bring benefits and increase people's security in energy use. However, it will also bring new challenges, which will cause more uncertainties, especially for people living in more developed areas where the latest development is happening. This echoes the argument earlier that the potential threats, rather than established ones, and the security threats facing those in developed countries should also be incorporated into human security considerations.

Amongst the existing human security studies of energy transition, most focus has been given to the power sector, stressing the human security impacts brought by the progress made in electricity generation from renewable resources. (Veilleux, 2013; Ziv et al, 2012; Howe & Kamaruddin, 2016) Amongst all major areas involved in the energy transition, changes in our access to transportation and how human security factors are affected are largely overlooked or underestimated in the current debate.[13] Within the scenario of fast market changes, the public's acceptance of the latest development plays a decisive role in the outcome of policy implementation. "The discourse and practice of human security leads states and policymakers to focus on different issues, to ask different questions, and to promote different policies…"

[13] There is an exception. Kester (2019) examined the phenomenon of range anxiety, a widely discussed EV concern regarding the constant alarm of running out of electricity before reaching the destination of the recharging station, from a human security perspective. It has set an excellent example of how the automobile transformation can be addressed with a human-centric approach. Range anxiety will be discussed in more detail in the following chapters of this research. Meanwhile, other EV-related concerns among the Chinese people will also be incorporated into this research.

(Krause, 2007, p. 2) Energy transition provides an ideal perspective through which the relationship between state security and human security can be better explained and further explored.

It is important to admit that the energy transition will still be going on in the foreseeable future, and it is still too early to review in a broad sense what this transition means to human security. However, it is time to start looking at it in some sectors where significant changes have already been made on a relatively large scale. There are three primary criteria for the case selection. As this research aims to explore how human energy security has been affected by the latest development during the ongoing transition, areas most closely connected to human life or by which human security is most widely influenced are the target of the case selection. At the same time, the transition is indeed gaining momentum nowadays. It is also true that, as mentioned earlier, it will be an ongoing process in the few decades to come. Fossil fuels are still expected to be the major energy resources in the world's energy mix. Traditional ways of energy production and consumption will still dominate in the near future. (Ritchie et al., 2020) The impacts of new technologies on human security are still limited compared with traditional ones. This means the area this research chooses to study is supposed to be relatively well-developed and has already impacted human security. The unique position of energy in understanding security, as noted in the earlier section, leads to the third criterion. Since one primary goal of this research is to propose alternative interpretations of the broad human security approach, which can be facilitated by better understanding the relationship between energy security on the state and individual level, the case chosen in this research is better considered a national energy security issue. Only in this way, a comparison can be made between considerations on the national level and individual level in policymaking and implementation.

Amongst all breakthroughs of the energy transition closely related to people's everyday life, the development of EVs has gained momentum in the past decade and has exerted a significant influence on the lives of many. The global EV fleet expanded significantly over the past decade, supported by ambitious policies and a growing market and technological progress. (IEA, 2020, p. 10) Sales of electric cars topped 2.1 million in 2019, which boosted the stock to 7.2 million worldwide. (IEA, 2020, p. 10) Accounting for around half of the EV production in the world, China is leading this world mobility transformation. Among all 7.2 million electric cars on the road in 2019, 47% are in China. (IEA, 2020, p. 11) The development of China's EV industry

will significantly shape the progress of the mobility sector transition globally. This constitutes a reason why the development of the EV industry in China is chosen as the case study of this research.

Changes in mobility trends influence Chinese people's energy use behaviours and bring changes to their daily lives, as it requires adopting alternative energy sources and new technologies to power their mobility. Added to the unique meanings of and approaches to human security adopted in the Chinese context, important human security considerations may emerge during the process, not only in terms of the narrow understanding of physical security but also in a broad sense of well-being and full development of human beings. There is rarely in-depth or comprehensive research on the human security impacts of the development of EVs, which is considered a significant step in the transition of the mobility sector worldwide.
It is important to note that apart from being embedded in people's everyday lives, EV development is also a national energy security concern. As will be illustrated further in the next chapter, the development of the EV industry in China has strong state-level energy security implications. The development of the EV industry provides an innovative angle to explore the relationship between energy security considerations on both national and individual levels. This research will demonstrate that gaining the acceptance of its people, that is, taking the energy security needs of individuals into account in policymaking, is necessary for a country to achieve its energy security goals during the energy transition.

The broad human security approach considers multiple providers of security. The case of China's EV development may provide evidence for it. As noted earlier, human security criticisms assume that even though human beings are considered the subject of security, the major security provider is still the state. This is particularly reflected in the current Chinese understanding of human security. There is a lack of agency for individuals to stand up and protect themselves. However, given that threats facing human beings are diverse and interlinked, interdisciplinary and comprehensive analysis is required in human security research. (Tadjbakhsh, 2014) The interdisciplinary nature of human security means that solutions require multiple actors, including non-state actors. Energy transition means both the circumstance and the roles played by stakeholders are constantly changing. Not only new technologies but also new actors are incorporated and connected. The case of China's EV development will promulgate the role of car businesses, including emerging EV makers in the industry, in the human security pantheon as they play an increasingly significant role in

increasing public acceptance of the new mobility idea, which is essential for a successful transition.

Apart from traditional stakeholders in the energy sector, such as governments, NGOs, energy producers, suppliers, and transmission and distribution system operators, consumers, who used to be the pure recipient of energy, are becoming more active elements of the energy system. (Schweiger et al., 2020) The electrification of energy end-uses and new dynamics on the demand side have been major driving forces in the current transition. Car electrification will profoundly impact how people's mobility needs are met. People themselves, to some extent, can be their own protectors by making optimal choices. Their perception of it and following behavioural changes will also shape the path of the transformation. As will be shown in later chapters, the citizenship involvement and "cooperation" from the ordinary people needed in the automobile industry transition provide an excellent lens to examine the security agency within the hands of the ordinary people.

Conclusion

This chapter started with the narrow/broad debate of human security with an aim to lay the theoretical groundwork and demonstrate that the broad emancipatory approach is more suitable to address the security issues concerning individuals raised by China's EV development. By reviewing the UNDP human security approach – a representative broad human security approach - from three perspectives (Security for who? Security for what values and from what threats? Security by what means?), this chapter identified the lack of a comprehensive understanding of what the UNDP human security framework provides, which in part may have caused its limited application in the existing research. Meanwhile, the state-driven nature of the UNDP approach and the CSS's failure to provide an alternative powerful actor to protect have led to the criticism of human security's weak claims on the agency issue. Both have impeded human security's utility as a guide in analysing human energy security issues.

The following literature review on energy security, including the human-centric approach adopted within the existing energy security research, highlighted that energy threats facing human beings had not attracted enough attention in human security literature. Apart from the

limited understanding of the broad human security approach within the existing literature, the construction of energy as a national security concern also renders energy security less visible in the human security narrative. Even fewer studies have engaged with the uncertainties facing human security during the energy transition. The ongoing energy transition provides a lens to more comprehensively understand human energy security. Amongst all the breakthroughs of the energy transition that are closely related to people's everyday life, the development of EVs has gained momentum in the past decade and has exerted a significant influence on the lives of many. It has brought the latest technologies and new "user experiences". It has also encouraged heated discussions amongst the Chinese public on how acceptable the new mobility option is. Thus, apart from the most vulnerable and disadvantaged, the energy transition provides an opportunity to explore the underexplored dimension of the mass public – as the development of green technology will influence the life of not only the marginalised but also the majority of the population, if not everyone. Meanwhile, the changing roles of multiple actors, including the emerging EV makers, provide a compelling case for revisiting the security agency issue within the human security discussion. It also raises implications of how the applicability of the human security approach can be further explored.

This chapter explained from a theoretical perspective how the human energy security case, China's EV development in this case, can help better understand the broad human security approach. An overview of the meanings of and approaches to human security in China was incorporated to better contextualise human security and lay the theoretical groundwork for examining how the unique case of China may contribute to the theorisation and understanding of the broad human security approach. From an empirical perspective, the next chapter will delve into China's EV industry development as a strategic consideration of the Chinese government to improve its energy security and explain what a human security approach can tell in the examination of the sustainable development of the industry.

Chapter 3 China's energy security and EV development

Introduction

The previous chapter focused on the human security theory and how the case study of China's EV development will contribute to its understanding. This chapter will focus on how the human security approach can help understand China's EV development. Defined as an industry of strategic importance in China's ambitious green technology revolution, sustainable EV development serves a critical role in improving both China's energy security and national security in general against the backdrop of the changing geopolitical dynamic of global energy competition. Based on the theoretical analysis conducted in Chapter 2, this chapter will illustrate why a human security approach is necessary for understanding the implications of China's EV development as a national energy security strategy on its people, which cannot be explained through traditional security thinking, and more importantly, how this understanding at the individual level has the potential to inform the sustainability of the industry, which is necessary for it to serve its strategic purposes on the state level.

This chapter will begin by examining the Chinese EV industry's strategic role in ensuring the country's energy supply by reducing its imported oil dependence and gaining an advantage in the new round of green energy competition. It will be followed by an overview of the less satisfying domestic EV market performance with a particular focus on the private ownership of passenger EVs. As will be illustrated later, the Chinese EV development is aggressively policy-driven and is facing a relatively low acceptance rate by the Chinese people. A primary reason, amongst others, may be the insecurity and uncertainty people face and feel towards EVs in meeting their mobility needs. Drawing on China's holistic national security strategy, which prioritises the security and well-being of its people (China Internet Information Centre, 2016), this chapter will illustrate why the domestic market and the ordinary people's concerns matter in the context of China's national security needs, which will help justify the necessity and significance of introducing the human security approach in evaluating the development of the Chinese EV industry.

3.1 China’s energy security needs and the development of the EV industry

As indicated in the introduction, this chapter will explain why an understanding of human security concerns, that is, the concerns of the Chinese people over China’s EV development, is important in the fulfilment of the industry’s strategic purposes. Before delving into the explanation, it is necessary to examine the industry's strategic purposes. The term “energy security” is frequently spotted in studies of China’s EV development. It is often seen in the introduction section as a justification for the significance of the EV-related puzzle the study is about to address. (Sovacool et al., 2019; He et al., 2021; She et al., 2017) However, there is little systematic analysis of China’s energy security concerns and how EV development can help solve them. (Drenth, 2019) In this case, this section will situate China’s EV industry development in the energy security narrative and elucidate the significance of the industry in serving its strategic purposes out of China’s energy security needs.

The significance will be illustrated from two perspectives. Sections 3.1.1 and 3.1.2 will address traditional energy security concerns, i.e., China’s increasing reliance on imported oil and how the EV development will help alleviate the concerns. The analysis will be conducted based on the 4As framework: availability, affordability, accessibility, and acceptability. It is one of the most frequently adopted frameworks in analysing energy security on the state level and the frequent starting point of contemporary energy security studies. (Cherp & Jewell, 2014, p. 416) The traditional oil supply concern discussion will be complemented and supported by other national security considerations regarding the role played by China’s EV development in helping China in the new geopolitical competitions in the new energy era amongst major world powers in Section 3.1.3, such as the sourcing of strategic minerals essential for green energy development, and green technology and trade. The elucidation of the close connection between China’s national energy security concerns and its EV development will clarify the empirical context of this research and lay the empirical foundation for the next section in explaining the significance of a human security perspective in the analysis of China’s EV development.

3.1.1 China's import oil dilemma and coping strategies

Import oil dependency has been well recognised as China's first and foremost energy security concern. (Kardon, 2013) It has become increasingly severe. The country's primary energy self-sufficiency rate has decreased since the early 1990s. (Delman, 2018) In 1993, China's economic expansion outpaced its oil production capability, resulting in China becoming a net oil importer for the first time since the 1970s. (Wang et al., 2018, p. 151) Since then, it has seen a growing dependence on sourcing crude oil from abroad. (Paraskova, 2020; Zheng, 2019) In the first half of 2020, China, as the world's top oil importer, imported 73.4% of its oil needs. (Paraskova, 2020)

The problems caused by China's increasing oil dependence are worsened in a world where "oil disruptions are commonplace". (Drenth, 2019, p. 7) China is highly dependent upon seaborne oil imports, principally from the Middle East and other politically volatile regions. (Kardon, 2013, p. 308) Apart from the political instability of these regions, security hazards that jeopardise vital maritime chock points and sea lanes, the Strait of Malacca[14] in particular, are another major concern. (Drenth, 2019, p. 7) The imported oil that China increasingly relies on is shipped through vulnerable chokepoints and the contested South China Sea. (Kardon, 2013, p. 309) "China has every reason to be concerned about the safety and smooth passage of its shipments." (Zhang, 2011, p. 7613) An energy import cutoff enforced by a naval blockade would trigger a rapid collapse of China's economy and paralyse its military forces. (Tara, 2017)

Strategies have been made by the Chinese government to minimise the future risk of damage caused by oil import disruptions and maximise its energy self-sufficiency. On the demand side, China has made efforts to control the growth of its demand for energy by introducing constraints on energy consumption in policymaking. For example, China has required in its 11th five-year economic plan that energy use per unit of GDP is cut by 20% during the period running from 2006 to 2010. (Zhang, 2011, p. 7613) In terms of reducing the risk of seaborne oil import, China's "highest strategic priority" is to connect friendly oil exporters via pipelines

[14] Eighty per cent of China's oil has to pass through the Strait of Malacca, a narrow stretch of water between the Indonesian island of Sumatra and the Malay Peninsula. (Khan, 2019) The "Malacca dilemma" was coined by former Chinese President Hu Jintao in 2003, referring to a strategic vulnerability that China has a high dependence on the Strait of Malacca in terms of both economic security and geopolitical security. (Chen, 2010, p. 2; Blumenthal, 2008)

transiting through land routes beyond the effective military reach of the US. (Tata, 2017) With the Belt and Road Initiative (BRI), this strategy to enhance China's energy security might be achieved along with the building of new land pipelines, roads, and railways, which can help diversify China's energy mix, energy suppliers, transport routes and settlement currency. (Li et al., 2018, p. 335) Besides, China plans to boost its energy security by increasing domestic oil production. The country's three giant oil companies (China National Petroleum Corp, China Petroleum and Chemical Corp and China National Offshore Oil Corp) have established an ambitious internationalisation strategy and increased investment in oil exploration worldwide to boost the country's oil reserve.[15] However, the efforts were still insufficient to ease the country's surging demand. The prospect of increasing domestic production is not promising. "We can only expect stable production rather than a rise in the near term, which is still far from enough to meet the gap," said Li, research director at energy consulting company ICIS China. (Zheng, 2019) It is predicted by experts that the country's dependence on foreign crude oil imports will not ease in the short term. (Zheng, 2019)

Amongst all strategies to increase China's oil security, one is given less attention in the academic literature, which is the country's ambitious goal for a world-leading mobility sector transition. The growth of its motor vehicle industry significantly contributes to the surging oil demand. With the rapid increase in new vehicle sales since 2000, China had become the largest new vehicle market in the world by 2009. The transportation industry accounts for around half of the country's oil consumption. (Li et al., 2016, p. 535) With the rapid growth of vehicle ownership, the oil consumption of China's transportation industry will continue increasing, which poses enormous challenges to China's energy security. (Liu et al., 2018, p. 92) A transition of the transportation industry towards sustainable energy sources is urgently needed in curbing China's surging dependence on oil imports. A significant endeavour of the Chinese government to make this transition happen is to electrify the sector using EVs. (Zheng et al., 2012)

[15] For a detailed remark about the investment of Chinese national oil companies since 2008, see Dannreuther (2011, p. 1345).

3.1.2 The contribution of the EV industry development to China's energy security – from the 4As perspective

Recognising its rapidly growing vehicle stock is a major contributor to the country's surging imported oil demand, which is its foremost energy security concern (Drenth, 2019, p. 23). China has regarded the transformation of its transportation industry as a promising strategy to alleviate China's oil anxiety. Accounting for around half of the global EV production, China is leading the world mobility transformation. Its leading position has almost entirely been the result of highly ambitious policies. (Drenth, 2019, p. 6). Shortly after China lost its oil exporter position in 1993, EV development was highlighted and chosen as one of the "National Key Science & Technology Industrialization Projects" in the 9th Five-Year Plan (1996-2000) published in 1995. (cev.com.cn, 2004) The first National Electric Vehicle Test and Demonstration Zone, which is regarded as the "cradle of China's EV development", was established in Shantou, Guangdong province in the following year as part of the project. The industry emerging "in the direct aftermath of China's return to a dependency on oil imports and around the same time when energy security emerged as a primary focus of Chinese academics and policymakers" suggests that the EV industry has been framed as a strategic response to China's energy security concerns. (Drenth, 2019, p. 24) Since then, the EV industry has been portrayed as an emerging strategic industry to enhance China's energy security in the following 12th (2010) and 13th (2015) Five-year plans and China's primary manufacturing strategy Made in China 2025.

The development of electric vehicles is often depicted as a technological or economic cause and an effort to fight environmental issues.[16] Its strong link to national energy security is often given less attention. While it is intuitively the case that domestically produced electricity can be much more secure than the ever-growing dependence on foreign oil, so far, there have been a limited number of studies addressing the link between EV development and energy security (Drenth, 2019) and no in-depth examination of the implications of China's EV development on its energy security. The 4As framework is well recognised as the frequent starting point of contemporary energy security studies. (Cherp & Jewell, 2014, p. 416) The framework has

[16] Two motivations behind China's aggressive EV policies have been given much attention: the environmental factor - reducing air pollution in Chinese cities; (Tyfield & Zuev, 2018) and the economic and technological aspect - transforming China into the global market leader of the automotive industry of the future. (Bohnsack, 2018)

gained traction in recent literature. (Rutherford, 2020, p. 7) A sizable amount of energy security studies are conducted based on it and its derivatives. (Yamanishi et al., 2017; Yao & Chang, 2014; Kruyt et al., 2009; Fouladvand et al., 2022) It is considered to be capable of reflecting the complexity of energy security in a comprehensive manner. (Cherp & Jewell, 2014) The contribution of EV development to China's energy security can be well demonstrated under the 4As framework. The following section will begin with an overview of the 4As framework and its adoption in energy security research. The section will proceed with an examination inspired by the 4As framework of the crucial role played by the development of the EV industry to improve China's energy security, not least by reducing China's increasing reliance on imported oil.

History of 4As framework and its adoption in energy security research

Arguably, the framework originates in a 1981 health services policy study, where the As framework was introduced to better describe "the fit" between patients and the healthcare system. (Penchansky & Thomas, 1981, p. 127) Since then, the As framework has been widely referred to in other research areas such as social protection and human rights (Office of the High Commissioner for Human Rights, 2000), public transport development (United Nations Human Settlements Program, 2013, p. 108; Gomide et al., 2005), food access (Usher, 2015, p. 111), energy (Acharya, 2002), education and public services. (Cappa, 2007)

The first endeavour to adopt the As framework in energy security studies was the research conducted by the Asia Pacific Energy Research Centre (APERC) to provide APEC economies with guidance for enhancing energy security and sustainable development. (APERC, 2007, p. 6). The study of energy security emerged during the 1970s oil shocks. As such, "classic" energy security research prioritises the availability and affordability of the oil supply. (Cherp & Jewell, p. 416) It focuses on avoiding supply risks resulting from potential oil supply disruptions in major oil-exporting regions, especially the Middle East. (APERC, 2007, p. 5) The emphasis on availability and affordability is still clearly shown until recent years in how energy security is defined. For example, the International Energy Agency (IEA) defines energy security as "the uninterrupted availability of energy sources at an affordable price". (IEA, 2014) The APERC report was fully aware of this. At the same time, it also realised that contemporary challenges facing energy security are getting rather multi-dimensional, as various factors affect the stability of the energy supply and its prices, such as political conflicts, natural disasters, terrorist attacks on major energy infrastructures and energy-related environmental problems. (APERC,

2007, P. 5) In this sense, two more dimensions (accessibility and acceptability) were added to the original energy security conceptualisation. The 4As framework comes to be one of the most comprehensive and efficient assessment systems to review the long-term energy security situation of a state. It provides major guidance for energy policymaking on the state level.

The contribution of the EV industry development to China's energy security – from the 4As perspective

The APERC research was conducted on the state level with a conventional focus on fossil fuels. In the APERC research, *availability*, especially oil availability, refers to the natural oil reserves of a state and its reserve-to-production ratio (R/P ratio). (APERC, 2007, p. 7) The Chinese government's efforts to increase China's domestic oil production, as noted earlier, constitute a major strategy to increase its energy availability. Instead of increasing the national oil reserve, the development of China's EV industry is often depicted as technological breakthroughs to replace the need for traditional oil with new energy - electricity. The electricity comes directly from China's electricity grid and can be generated from multiple domestic sources, mainly coal. (Drenth, 2019, p. 8) Compared with oil, coal is more available to China thanks to its large domestic coal resource base. (Medlock, 2021) "The country's coal fleet is very young, with a huge amount of capacity coming online in the last ten years and more to come." (Medlock, 2021) This transition in how automobiles are powered will help China reduce its dependence on imported oil, improve its energy self-reliance, and replace it with much more available coal, even though it may cause more environmental concerns, which will be illustrated later in the *acceptability* section.

Regarding *accessibility* barriers, the APERC research emphasised the potential disruptions caused by geopolitical and geographical constraints. (APERC, pp. 19-20) the "Malacca dilemma" noted earlier constitutes one of China's significant vulnerabilities in energy accessibility. (Dannreuther, 2011, p. 1346) Compared with secure oil access, coal is "in an advantageous position over other fossil fuels". "There is a tendency for the coal to be used by the producer themselves." (APERC, p. 1) China is the largest coal producer in the world. (Drenth, 2019, p. 17) As Wang Peng (2021), a professor at North China Electric Power University, put it, "正如强调粮食安全时讲 '饭碗必须牢牢端在自己手里'，保能源安全应明确提出 '炉子必须稳稳生在自己家中'。" (Just like when talking about food security we say, 'the bowl must be held tightly in our own hands', we should make sure that

'the stove is lit in our own home' when it comes to energy security.") Wang's remark echoes the growing recognition long promoted by western commentators that "in times of major crisis in the oil markets neither the possession of overseas reserves and equity oil production nor long-term supply agreements will be of much value". (Dannreuther, 2011, p. 1348) As a result, China has reiterated in its *Report on the work of the government 2022* the logic of securing its energy supplies "based on the country's natural endowment (立足资源禀赋)", meaning the abundance of coal and general lack of oil and gas. (The State Council of the People's Republic of China, 2022) By replacing oil with mainly domestic coal in powering motor vehicles, China reduces its reliance on foreign oil and minimises the potential damage caused by potential oil access disruptions.

EV development will increase the availability and accessibility of China's energy security. At the same time, thanks to the abundance of domestic coal reserves, burning coal is also more *affordable* than oil. [17]*Acceptability* mainly refers to environmental acceptability in the APERC research. It focused on the environmental concerns relating to the energy industry. (APERC, p. 27) Vehicles increasingly concentrate in megacities and city clusters in the eastern part of China and the capitals of the middle provinces, mainly because of the relatively well-developed economy and high personal income level. Due to imbalanced vehicle stock distribution, cities suffer from poor air quality, which is increasingly attributable to vehicle tailpipe emissions. (Gong et al., 2013, p. 208) The introduction of EVs may impact the alleviation of the local air pollution caused by the increasing and unbalanced automobile uptake in China, which echoes the environmental acceptability parameter of the 4As framework. It is, however, important to note that the electricity generated to power the EVs is still mainly from burning coal that is more available to China. Coal is the primary source of the country's energy security, and it remains the mainstay of China's primary energy consumption. (Zhao et al., 2021) It is thus hard to argue that fighting climate change is amongst the major driving forces of China's EV development.

[17] The wind is already cheaper than coal power in China by 2020. (The Guardian, 2020)

3.1.3 New geopolitical competitions in the green energy era

The EV industry is depicted as a strategic emerging industry in China, amongst other economic and environmental considerations, to improve the country's energy security level as more Chinese officials and scholars adhere to the "nationalist school" of energy security thought that energy policymaking in China is "likely to become increasingly entangled in questions of security". (Erickson & Collins, 2021) It is clear from the analysis above that China's EV development is a reasonable and necessary step alongside the country's national energy plan. It is a strategic response to the insecurity caused by imported oil reliance. However, less attention has been given to the scenario that the EV development, an integral contributor to China's leading position in green technology, has improved China's geopolitical standing in several other respects.

The world is constantly changing with the advancement of new technologies and the unfolding of the world energy system transition. "Geography was destiny in the oil age. Reserves were distributed unevenly around the world, creating anxieties about access and transport routes." (Jaffe, 2021, p. 34). "As we go from carbon [fossil fuels] to electrons, we will have a world order where the electron is more important than the carbon," says Auke Lont, chief executive of Statnett, Norway's state grid company (Hook & Sanderson, 2021) The world shifting away from the "oil weapon" era means the dynamic of the global energy competition is also changing. "A world where oil declines while batteries rise as geopolitical drivers would look very different to the world of today." (Dimsdale, 2019, p. 7)

Two schools of thought about the energy transition are identified by Hook & Sanderson (2021). "One believes it is a kind of clean energy realpolitik, marked by the desire to gain economic advantage. The actions of China, the US and Europe reflect this kind of thinking. But the other is that clean energy will involve a lot less geopolitics and might help reduce conflict — a more utopian future." (Hook & Sanderson, 2021) It is interesting to notice that the climate crisis is often depicted as a significant driving force for international cooperation, relationship improvement and confrontation avoidance (Yu et al., 2021) as "the fast cuts in carbon needed to stave off the worst of climate change are all but impossible unless these countries work together and basically trust each other's pledges." (Larson & Knickmeyer, 2021)

In contrast, an increasing number of scholars are calling for a more competitive approach to achieve goals in fighting climate change. “A more successful path runs not to a negotiating table but through the arena of competition.” (Erickson & Collins, 2021) Competition in strategic resources and green technology are seen as key tones in the new energy era. This new competition, apart from being a powerful catalyst driving countries to reduce carbon emissions, will also contribute to a changing global geopolitical landscape. It is especially the case in a world characterised by increasing competition, featuring the downward-spiralling and confrontational Sino-US relationship. “With the United States and China clashing politically and seeking to attract support to their respective camps, competition over technological, political, and business leadership on climate can actually prove a powerful spur.” (Myllyvirta, 2021) The new wave of energy innovation is poised to remake energy and transportation systems, potentially ushering in a new geopolitical order of winners and losers. (Jaffe, 2021) The master of green technology is the key to getting ahead in the latest round of the game and gaining from the new system. It is thus clear why the development of the EV industry in China is regarded as a strategic industry. Its fast development and leading position in the sector's development amongst all countries guarantee China more “cards” in the competition and negotiation in the geopolitics arena.

As illustrated under the 4As framework, the development of EVs will reduce China’s reliance on imported oil. At the same time, as new energy development continues, the development of the EV industry, which is part of the plan for the industrial transformation, becomes a new geopolitical battleground for influence and control. EV development plays a significant role in helping China get ahead in the new clean energy geopolitics, and this is becoming increasingly evident in various ways. As made clear in the State Council’s statement, China must “accelerate the cultivation and development of strategic emerging industries, master key technologies and related intellectual property right, and enhance its capabilities to develop independently, in order to win a favourable position in the future international competition. (我国要在未来国际竞争中占据有利地位，必须加快培育和发展战略性新兴产业，掌握关键核心技术及相关知识产权，增强自主发展能力。)” (The State Council of the People’s Republic of China, 2010) As will be later illustrated in this section, apart from the defensive posture of reducing dependence on oil imports, the development of EVs, as a new “field of honour”, supports China to play a more active role in the new round of the energy game, which is crucial for China to improve its geopolitical standing and global competitiveness in green technology and trade. It

also provides the possibility of repositioning states and shifting alliances, which might offer China leverage to gain the upper hand in world geopolitics. This section will discuss, apart from reducing the imported oil reliance, other strategic considerations regarding China's EV development from the perspective of two interrelated mechanisms: access to strategic minerals and green technology and trade. The analysis will demonstrate the strategic role of EV development on the state level to improve China's geopolitical stance and put China in a more secure position in the global system facing the global green energy revolution.

Access to strategic minerals

Along with the trend towards electrification of the global transport sector, the need for cobalt, nickel and other minerals could lead to increased competition for access to strategic minerals. (Dimsdale, 2019, p. 7) Due to their strategic importance, access to these elements will potentially be used, as oil has been, for a new round of energy "statecraft". (Dimsdale, 2019, p. 7) The green energy revolution has painted a promising picture ahead:

> In a renewable energy economy, most countries will be able to achieve energy independence: they will have greater energy security and more freedom to take the energy decisions that suit them. Since some form of economically viable renewable energy potential is available in most places, countries that currently depend heavily on fossil fuel imports will be able to use renewables to reap strategic and economic benefits. (INERA, 2019, p. 36)

Traditional energy forms (oil, gas, and coal) and renewables have been the primary objects of analysis in energy discussions. In this new energy world, the oil dominance in geopolitics begins to wane, and the fear of disturbing foreign energy resource accessibility seems less imminent in the changing energy landscape. (Drenth, 2019, p. 8) However, the strategic importance of strategic minerals in making the renewable scenario happen has not been given enough attention. While vital to specific energy systems, they rarely fit into energy security narratives. (Drenth, 2019, p. 8) The geopolitical battleground tends to shift from oil to other rare resources essential for green development. "Historically, resource conflicts have often centred on fuel minerals, like oil. Future resources conflicts may, however, focus more on the competition for non-fuel minerals that enable [modern] technologies." (Smith, 2018)

Compared with oil, which enjoys a more diverse source of supply, raw materials used in EV batteries come from a far narrower supply base. (Flowers, 2018) While extreme resource scarcity is not a high-probability scenario (Dimsdale, 2019, p. 7), the growth in demand for rare metals as the fundamental components of the renewable energy revolution may drive the shift of national energy security strategy to increase focus on ensuring a secure supply of strategic materials. (Smith, 2018) Since no country can domestically supply all rare minerals needed for its green technology development, and no new technology is yet to replace them, strategic minerals will play a similar role as oil has played in the past century in geopolitics. (Smith, 2018) Secure access to them, that is, ensuring the necessary level of accessibility with affordable costs, becomes crucial to ensure a secure energy supply for any country in the profound energy transition. China's concern over rare earth supplies during the recent military coup in Myanmar, an "exceptionally critical supplier of … feedstocks that are essential ingredients in high-strength permanent magnets for electric vehicle motors" (Reuters, 2021) is an example of the strategic importance of rare metals.

China's aggressive EV development constitutes a crucial part of its strategic plan to get ahead in the new energy competition in strategic minerals. The push for the global EV industry will increase demand for rare and precious elements like cobalt, nickel, and lithium, which are necessary materials for producing lithium-ion batteries. "If US control of oil supply choke points has long been recognised as a vulnerability for oil importers including China, China has in turn identified the growing demand for minerals needed for clean energy technology as a geostrategic opportunity." (Dimsdale, 2019) The development of the EV industry in the past decade has bought China valuable time to access strategic resources and get ahead in the new world competition shifting from oil to other scarce resources, which is crucial for China to gain a favourable position in the new energy geopolitics and enhance its energy security.

As a major carrier of these strategic minerals, EVs constitute a significant driving force for China to plan and move forward in searching for and acquiring these new "energy weapons" proactively and aggressively. China now produces half of the world's electric vehicles. It is also the biggest battery producer and controls many raw materials crucial for clean-tech supply chains. (Hook & Sanderson, 2021) Take cobalt, a key ingredient in lithium-ion batteries, as an example. Chinese companies have invested heavily in cobalt extraction in Congo, where the metal is mainly mined globally. Now China controls more than 85 per cent of the world's

refined cobalt chemical capacity, essential for most lithium-ion batteries. Apart from cobalt, 80% of the world's mined supply of rare earth, which is used in electric motors and required for other clean energy technologies, is controlled by China. (Dimsdale, 2019, p. 10) "Making an electric vehicle without involving China is almost impossible." (Hook & Sanderson, 2021)

Green technology and trade

Apart from reducing the risk posed by oil import, more significant innovation in energy technology deployment and manufacturing, including EV development, has established China as a major exporter of clean energy technology, which helps it create a balance of trade advantage. (INERA, 2019, p. 42) With its commitment to controlling the key low-carbon technologies and businesses and spreading its standards for critical technologies and infrastructures, such as electric vehicle charging, China appears to have a winning edge in the geopolitical shift. China is now the world's largest producer, exporter, and installer of prominent green technologies, including batteries and EVs, which places it at the forefront of the global energy transition and in a favourable position to gain a trade advantage. The focus on green technology innovation indicates that China is well positioned to gain the most from the global transition. (INERA, 2019, p. 40) The clean options offered by China as its major industrial exports, including EVs and EV-related technologies and infrastructures, provide a platform for China to connect and build closer relations with countries in Europe, Central Asia and Southeast Asia who are eager for upgraded energy and transport infrastructure and solutions to energy-related pollution and insecurity. (Jaffe, 2018b)

The EV development exemplifies China's momentum gained in the green revolution. In the traditional ICEV battleground, Chinese vehicles have failed to gain traction amid stiff competition against American, European, Japanese, and South Korean manufacturers. China's leading automobile export destinations have been developing countries, with nearly half of its vehicle export in Asia. (Ma, 2021) Chinese automotive enterprises contributed only 6.2% of all imported vehicles to the EU from 2006 to 2019. (Wagner, 2020) None of the domestic Chinese brands has managed to enter the US market. (Shiraishi, 2020) With the rising popularity of EVs and the global trend towards the electrification of the transportation sector, Chinese vehicles, parts, and key technologies are given a chance to catch up. Chinese carmakers are making inroads to Europe and the US for EV sales. These carmakers, such as Xiaopeng Motors (XPeng), started deliveries to Europe in December 2020. (Devonshire-Ellis,

2021) Popular Chinese EV model Roewe Ei5 was launched in the UK rebranded as MG5 in 2020 and became the first all-electric wagon in Europe. (Nedelea, 2020) At the same time, an increasing number of world-renowned carmakers, including Tesla, BMW, Renault, and Daimler, have produced or are seeking to make EVs in China destined for sale in Europe. (Williams, 2020) China's advancement in green technology and trade will not only benefit Chinese carmakers but also make Chinese standards for advanced vehicles the global standard. (Jaffe, 2018a)

The analysis above demonstrated the strategic importance of the EV development in China's energy security vision in an era when the world is going through a significant energy transition and major powers accordingly are experiencing geopolitical repositioning and alliance shifting. Pascal Lamy, former head of the World Trade Organization, indicates the major shift happening at a fast pace in the global energy system: "If you compare the world today to the world 18 months ago, the big difference is that…only 25 percent of the world had a decarbonisation horizon. Today, 75 percent of the world economy has a decarbonisation horizon." (Hook & Sanderson, 2021) A new world order is emerging as the green global energy interconnection dynamic forms. The illustration in this section shows China's driving force and determination to electrify its transport section. However, for the EV industry to serve its purpose of empowering China with more strategic edges, determination from the government, that is, aggressive policymaking, is not enough. The sustainability of the domestic market also plays a key role. This is where the human security narrative fits in this research. Unlike other energy strategies on the state level, such as increasing domestic oil production, building pipelines connecting China with friendly oil producers, and developing wind power that do not involve much in everyday life of ordinary people, the development of EV is closely related to meeting people's essential mobility needs. Private car use is deeply ingrained in how people make sense of and navigate not only their streets but their place in the world. Changes in mobility trends and behaviours have profound human security implications, not only in terms of the narrow understanding of physical security but also in a broad sense of well-being and full development. This feature of EV development adds a human security dimension to its role of serving national security goals. As will be illustrated later, winning the domestic market and the acceptance of ordinary people are necessary for the sustainable development of EVs in China. The following section will elaborate on why a human security perspective is necessary for China's EV industry to attain its state-level energy security goals.

3.2 Why is a human security perspective needed?

This section addresses why a human security perspective – a focus on the implications of the transformation of people's mobility choices and experiences on their well-being and how their daily essential mobility needs are met - is necessary for EV development as a strategic move to meet China's energy security needs. "For most people today, a feeling of insecurity arises more from worries about daily life than from the dread of a cataclysmic world event." (UNDP, 1994, p. 3) The UNDP human security recognises people's needs to seek security in their daily lives and stresses the protection of people from interruptions in the pattern of their daily lives: "whether in our homes, in our jobs, in our communities or in our environment." (UNDP, 1994, p. 3) The previous section addressed China's energy security concerns through the lens of EV development. Compared with analysis on the state level, the human security approach offers powerful alternative insights based on the perception of an optimal outcome that the new energy revolution is advanced in a manner that does not sacrifice individual security or limit the potential for personal growth and empowerment.

The significance of a human security dimension of the EV development can be understood from China's holistic view of national security (总体国家安全观), which indicates that human security constitutes an essential element of how the Chinese government perceives security.[18] The previous chapter overviewed the meaning of and approach to human security in the Chinese context. The human-centric approach interpreted with Chinese characteristics is exemplified by introducing the holistic view of national security. It is repeatedly mentioned in Chinese policies. The sense of security and well-being of the Chinese people (人民群众的安全感、幸福感) is constantly stressed as a determinant element of China's holistic national security strategy. （Xinhua, 2016）

[18] As noted by Evans (2004, p. 364), Asia is not "frequently at the cutting edge of human security thinking or practice". Human security was at the margins of security policy and discourses in Asia despite its "Asian pedigree", which can be explained by the continent's embrace of "a postcolonial, neo-Westphalian security order emphasising state-building, national sovereignty and non-interference in domestic affairs". Since the 1997 economic crisis, however, more focus has been given to the broader understanding of security and the idea of "non-traditional" threats, which opened a window for human security discussions. Evens (2004, p. 364) also pointed to the increasing receptivity of the human security concept in China.

The holistic view of national security was proposed by President Xi Jinping in 2014. It has transitioned from a theoretical to a strategic system of top-level design and work deployment. (Chen, 2021, p. 38) It is believed to be the guiding national security strategy in China[19] and has been incorporated into the Party constitution. (Feng, 2022, p. 2) To extend beyond the confining understanding of national security and strict military-based hard power considerations, the holistic view of security is richer in connotation, broader in scope, and more complex regarding its domestic and external factors. (Fu, 2021, p. 30) "We must pay close attention to both traditional and non-traditional security, and build a national security system that integrates such elements as political, homeland, military, economic, cultural, social, science and technology, information, ecological, resource and nuclear security." (Xi, 2014)

Security issues, under the holistic view, must be construed and addressed as an organic and integrated whole, both internally and externally. (Fu, 2021, p. 30; Yuan, 2021, p. 3) Political security is considered "fundamental" to the holistic national security. (Fu, 2021, p. 30; Chen, 2021, p. 38; Yuan, 2021, p. 2) The view highlights that apart from the national security challenges facing China internationally, domestic security issues ranging from social inequality and environmental pollution also need attention. As Chen (2021, p. 39) argues, "[t]he holistic security concept is effective in the strategic game with the US, an all-round traditional security challenge, but also with the pandemic".

The attention given to political security in the holistic view of security has always been a concern that can be traced back to the establishment of the party state. The Chinese concept of security has consistently relied on the set of primary considerations introduced by Mao that there are both domestic and foreign enemies. (Vuori, 2011, p. 229) "Although the official Chinese security 'concept' has undergone changes in its content and implications for policy, it has retained a preoccupation with sovereignty, territorial integrity, [and] maintenance of the political order." (Vuori, 2011, p. 229) With the absence of threats of a major war and salient external challenges since the mid-1980s, domestic stability and unity of the Chinese society have become the main 'security good' pursued by the party state. (Vuori, 2011, p. 231; Swaine, 2004) The bond between the Party and the people to ensure the longevity of the Party has been a central consideration in China. (Lanteigne, 2016, p. 28)

[19] For the development history of the holistic approach and Xi's illustration of the approach under such labels as "ten adherences" and "five coordinations", see Feng (2022).

The preoccupation with domestic stability (Vuori, 2011) can be used to explain the position given to people's security as the "purpose" and "ultimate goal" of the holistic national security architecture. (Chen, 2021, p. 38; Yuan, 2021, p. 2) In fact, this people-centric approach has been adopted by previous Chinese governments to justify the Party's role as the only guarantor of the safety and prosperity of the Chinese state and Chinese people. (Lanteigne, 2016, p. 42) Former Chinese president Jiang Zemin's "Three Represents" (三个代表） theory argues for the legitimacy of the Party, and it represents 1) the development trend of China's advanced productive forces, 2) the orientation of China's advanced culture, and 3) the fundamental interests of the overwhelming majority of the Chinese people. (Mohanty, 2003, p. 238) The emphasis on the security of the people has continued under Hu with the idea of "putting people first" (以人为本), which is the essence of his Scientific Concept of Development (科学发展观). "To put people first, we should take people's interests as the starting point and foothold of all of our works, make continuous efforts to meet various needs of the people and promote an overall development of the people." (China Internet Information Centre, 2007) The Scientific Concept of Development was added to the party constitution at the 17th Party Congress as "a major strategic thought" (重大战略思想) to guide economic and social development. (Breslin, 2015, p. 253) Scientific development means development that is geared to "realise people's wishes, meet people's needs, and safeguard people's interests" so as to "achieve a comprehensive development of the people". (China Internet Information Centre, 2007)

The following incorporation of human security narratives in its holistic national security strategy reiterates the emphasis given to the people in China's overall security policymaking. Protecting Chinese citizens is prioritised. The holistic national security system envisaged by the Chinese government emphasises "taking human security as 'the ultimate concern … 'all initiatives … will be people-centred, and implemented for the people, on the basis of the people's needs, and with the support of the people (以人民安全为宗旨 …… 坚持以民为本、以人为本，坚持国家安全一切为了人民、一切依靠人民，真正夯实国家安全的群众基础)". (China Internet Information Centre, 2016)

The holistic national security view indicates two layers of meanings on what security means and how to achieve security goals. It "redefine[s] the concept of national security" by linking

security to “people’s psychological perception, family happiness, job safety, and ecology and environment safety', as “only the people-centred national security strategy can rally support from its people.” (Liu, 2019) Security cannot be achieved by only focusing on geopolitics on the international level. The government pays great attention to its role as a provider to its people. At the same time, it also emphasises that attaining national security depends on the security and well-being of its people. This view echoes the mainstream human security discourse that “state sovereignty and the primacy of the state are justified only to the extent that the state's claim to protect the people within its boundaries is credible, since the only irreducible locus of sovereignty is the individual human being”. (MacFarlane, 2004, p. 368) State security is based on human security; “its legitimacy is based upon its ability to protect the individual”. (Shani, 2017, p. 279)

As discussed in the previous chapter, human security in Asia is still statist by nature. This is also the case in China, as even though people’s security is regarded as the ultimate goal in the holistic national security approach, the word “holistic” should be understood as a call for “top-level design and a comprehensive, systemic approach”, (Fu, 2021, p. 29) As a path taken to enhance its energy security on the state level that closely related to the Chinese people, the domestic dimension of China’s EV development matters in the context of China’s holistic national security strategy. Making sure people-centred considerations are taken into account in the transport section transition is in line with China’s national security strategy claiming to prioritise the welfare of its people. In this sense, an exploration from a human security perspective is necessary for a comprehensive understanding of the role played by China’s EV industry in serving national security purposes.

However, this people-centric approach is not fully expressed in China’s EV policymaking. Amongst all implemented EV policies, including fuel consumption regulations, credit management policies, and carbon quota policies (Liu et al., 2018, p. 92), infrastructure promotion policies, and R&D promotion policies (Zhang et al., 2017, p. 698), only limited financial incentives, such as tax exemptions and price subsidies, are closely related to ordinary people and early adopters. In other words, only factors concerning *affordability* have been taken into consideration in EV policymaking. What makes things worse is that while the new mobility tool has not yet won people’s hearts, the government has been decreasing car purchasing incentives as the subsidy phase-out mechanism for EVs started. (Zhang et al., 2017, p. 700) EV subsidies were initially scheduled to be phased out by the end of 2020. They were

later extended to the end of 2022 over concerns about the detrimental economic consequences of the Covid-19 pandemic and the dropping of EV sales in China from 2019 triggered by the subsidy phase-out mechanism. The pandemic has slightly changed the subsidy policy, but the trend in subsidy reduction is unlikely to be reversed.

It shows from the analysis above that only limited affordability elements have been taken into account in China's EV policymaking. Other human security considerations affecting the availability, accessibility, and acceptability of EVs amongst ordinary Chinese people, such as the dis/empowering characteristics of EVs and the driving behavioural changes required by the new mobility tool, which will be discussed in the following chapters, have not been fully embraced in the current policymaking, which, amongst other reasons, may have contributed to the fact that China's promotion of EVs repeatedly fails to achieve its target. The targets set in official documents have been modified over time as the original goals have not been achieved in the planned schedule. (Pelkonen, 2018, p. 4) The pilot program of "Ten Cities, Thousand Vehicles (TCTV)" launched in 2009 marked the beginning of official support for the mass deployment of EVs with substantial governmental financial subsidies, even though China's efforts to invest in EV-related R&D can be traced back to the 1990s. (Zheng et al., 2012, p. 17; Gong et al., 2013) Twenty-five cities were chosen in the program as pilot cities to deploy 1,000 electric vehicles in three years. In the end, only seven out of the twenty-five cities reached the target. The program also set an ambitious EV sales goal of 10% of total automotive sales by 2012. (Wan et al., 2015, p. 116). Only 17,600 EVs, however, were sold nationwide in 2013, less than 0.1% of total civilian vehicle sales. (Wan et al., 2015, p. 117) In response, the government adjusted the target to produce 500,000 EVs by 2015. (节能与新能源汽车产业发展规划 (2012-2021)) The revised goal was, once again, not met in 2015, despite generous financial subsidies and inflated sales numbers due to subsidy fraud. (Hou & Li, 2020, p. 67) [20] As noted earlier, with a new round of EV purchase subsidies cut off by around half, China's EV sales experienced a free-fall decrease in 2019. (IEA, 2020, p. 12) The sales fall indicates that EVs are not yet appealing to most Chinese people without financial incentives.

[20] An investigation conducted by the Chinese government in early 2016 found that some manufacturers had played tricks to receive the subsidies, which resulted in an inflated number of EV sales. For details, see Cui (2017).

A major reason for the "frustrating" performance of the EV industry within the domestic market and its disappointingly low acceptance rate of the mass public (Wan et al., 2015), amongst others, may well be the insecurity and uncertainty people face and feel towards EVs in meeting their mobility needs. Even though the new mobility idea and the mass production of EVs have been around for over a decade, ordinary Chinese people still feel insecure about it. Despite the government's highly ambitious development policies, large-scale financial incentive policies and rapid advancement of technologies, this innovative idea of mobility is not being accepted by the Chinese people. Chinese consumers have been hesitant, if not refusing, to adopt EVs. (Qian & Yin, 2017, p. 175) EVs are still widely regarded as "risky" mobility. (Tyfield & Zuev, 2018, p. 259) The insecurity can be sensed from public opinion. Various concerns, such as the unsatisfying driving ranges, lack of sufficient public charging infrastructures and performance uncertainty in different weather conditions, are frequently seen in EV-related public discussions on social media. These concerns may have kept people from accepting the government's efforts to promote EV development as an industry of strategic importance. Adding to the frequently happening car accidents in China involving EVs, a hotly discussed topic that has attracted much public attention within Chinese society, most Chinese people still feel insecure about and distrust the new mobility idea. They are sceptical of whether the EV is a reliable and convenient option for meeting their increasing mobility needs.

Unlike other energy strategies on the state level, such as increasing domestic oil production, building pipelines connecting China with friendly oil producers and developing wind power that do not involve much in the everyday life of ordinary people, the development of EV is closely related to meeting people's essential mobility needs. This feature of EV development adds a human security dimension to its role of serving national security needs. The case of EV promotion in China demonstrates the complicated relationship between state and human security: while the national energy security concern can be alleviated by the EV development, as it helps reduce China's dependence on imported oil and gain China advantageous edges in the new energy competition featuring strategic resources and green technology and trade, it is very debatable whether people's mobility, which is an essential part of the energy consumption of individuals, is becoming more secure, or if people are feeling more secure. While local air pollution problems the development of EVs tend to solve concerns about human health, whether the Chinese EV industry is eco-friendly, at least at this stage, is far from clear. Despite the development and government support of China's EV industry over the past decade, the

industry's failure to gain the acceptance of the mass public is a strong indication that people are not secure or at least feeling secure with the new mobility idea. Compared with the success of its EV policy on the international stage, the Chinese government has not been coping well with the development in human terms. There is a disconnection between the traditional security approach and human well-being and welfare. In other words, enhancing energy security on the national level does not necessarily mean its citizens are entitled to better energy services or a higher level of energy security.

The emphasis on state-level considerations cannot be used to justify the unjustified human experience. This echoes some human energy security scholars' argument noted earlier that national energy security does not necessarily mean human energy security, and indeed possibly their insecurity. Informed by China's holistic national security view that makes clear the critical role played by the security of the ordinary Chinese people in achieving national security, the complicated relationship between security on the state and individual level in China's EV development context can also be understood from another perspective, which justifies the empirical motivation of doing this research: in order for the Chinese EV industry to develop sustainably and fulfil its strategic mission of making China more secure, the government needs to take into account the human security dimension of the EV development, that is, the voice of ordinary people, and recognise the insecurity facing people embedded in the new mobility development. People being secure is referred to in China's holistic view of security as the foundation for state security. Translating it into the EV development context, winning the domestic market and the acceptance of the ordinary people are necessary for both the country's domestic security and ensuring the industry provides the necessary impetus for China to constantly reduce its reliance on imported oil and get ahead in the new energy competition. The key to the ultimate success of China's green revolution, the transition of the transportation industry in the context of this research, is the acceptance of the idea by the mass public and the following lifestyle transformation. This ambitious plan in the mobility sector requires more "cooperation" from ordinary people.

The contradiction identified in the attainment of state-level energy security goals and ensuring ordinary people's mobility security during the transportation transformation inspires this research to explore what this mobility transition as a national energy security strategy entails. In the name of enhancing national energy security, what does the development of the industry mean for the energy security of the Chinese people? What does this development bring for the

country and its people? Why is the move of the Chinese government not willingly accepted by its people? As Daniel Yergin puts it, the current demand for EVs "largely comes not from consumers, but from governments whose evolving policies are shaped by climate concerns and urban pollution and congestion". (Scharf, 2020, p. 8) The Chinese government has implemented a series of policies to promote and popularise the industry. It is, however, very debatable how much consideration of the security and well-being of the Chinese people have been incorporated in the policymaking for a healthy EV industry development. The drastic fall in China's EV sales in 2019, primarily due to the purchase subsidy reduction, indicates that government incentive policies are not a sustainable solution to the healthy development of the industry. (Ren et al., 2021, pp.1-2) Scholars have argued for increased attention to public concerns and more effective policy measures. "Since Chinese people's response is important for the government to push its energy security strategy, and the incentive policy itself is not powerful enough, it is important to dive deep into how people take the new development and what their concerns are. It is also important to explore their sentiments, the influence of which on vehicle selection strategies is ignored." (Ren et al., 2021, pp.1-2) Making people feel secure would be the key to the popularity of EVs, which is in line with China's holistic national security view that prioritises the security of the Chinese people. Technological issues, confusion, frustrations, lack of trust, and other factors may have led to the unwillingness of people to accept and embrace this prominent green technology. In this sense, the exploration of their source of insecurity is necessary. The human security framework helps " includ[e] subjective dimensions to the measurement of economic performance and social progress—as has been done with well-being and happiness". (Gomez et al., 2013, p. 25) By listening to the real-life stories of ordinary Chinese people with EVs, this research will explore how human security considerations can contribute to a better understanding of barriers to China's EV uptake, which is essential for the industry to play its role in meeting China's state-level strategic security goals.

While some countries such as Canada, Norway, Japan, and Switzerland have included human security considerations in their foreign policymaking (King & Murray, 2002, p. 589; Krause, 2007, p. 3), very few countries have adopted human security as a national policy agenda. Tadjbakhsh (2014) gave an interesting explanation. She believes it can be explained by the fact that most promoters of the human security concept are associated with the area of international relations that focus on foreign policies rather than domestic ones, such as Canadian ex-foreign minister Lloyd Axworthy, his Japanese counterpart Keizo Obuchi and ex-secretary general of

the Association of Southeast Asian Nations (ASEAN) Surin Pitsuwan. “With their interest in carving a niche on the international scene and projecting a positive image for their middle-power countries, they may have neglected to build up a momentum for a debate in their own countries for domestic applicability.” (Tadjbakhsh, 2014) As noted in the previous chapter, the human security approach opens up the possibility of “drawing together all the actors necessary to respond to a challenge” to ensure “integrated solutions that result in more effective and tangible improvements in the day-to-day life of people and their communities”. (UNTFHS, 2016, p. 8) The socio-technical transformation brought by EV development requires the cooperation of a wide range of stakeholders, which echoes the call of the broad human security approach for an open interpretation of the security agency. As Marquis et al. (2013, p. 53) put it,

> It is a great challenge to switch a country to a new generation of transportation technologies like EVs. This wide-scale, system-level change of enacting EV delivery to a mass market requires the coordination of many actors – governments, car manufacturers, battery developers, charging infrastructure providers, and consumers. It is too big a challenge that no actor can achieve on its own, no matter how powerful it is. Well-designed and properly implemented government policy is paramount for the industry to embark on the right track. At the same time, it is equally essential to reach coordination and cooperation between the private sector and the public.

The inclusive interpretation of security agency of the broad human security approach and the view that “participation by diverse actors is vital to developing socially relevant change strategies” (Trencher et al., 2021, p. 3) inspire this research to explore how actors, in addition to the state, can contribute to improving the human security implications of EV development. Meanwhile, together with protection, empowerment is also a key measure brought into the human security approach. “Empowering people and their communities to articulate and respond to their needs and those of others is crucial”. (UNTFHS, 2016, p. 8) The emphasis on empowerment allows this research to explore how individuals can be empowered to help make sure their essential mobility needs are met in the transition.

Conclusion

The EV industry in China is growing fast. This chapter examined that the electrification of cars is a long-term solution to China's national energy security concerns and a new tool to gain advantages in the latest round of green energy competition. The emphasis on the strategic development of the EV industry echoes China's holistic national security strategy that claims development is in tandem with and provides the basis for national security. (China Internet Information Centre, 2016) China is indeed spearheading technologies and trade in some green industries on a global scale, including EVs, EV batteries, and related infrastructures.

Within the Chinese society, however, the development of China's EV industry, despite unshakable determination and aggressive policy incentives, has been relatively unsatisfying. The "success" of China in the race for global EV leadership does not echo the low domestic acceptance level by the Chinese people. The uptake of EVs remains low, and this new mobility trend is not very well accepted by the majority of its people, which necessitates targeted measures to address. (Mukherjee et al., 2020, p. 1) As mentioned earlier, some frequently discussed concerns amongst the Chinese people, such as range problems and lack of trust, have resulted in the reluctance of people to embrace this "cleaner" electric technology. Even though various preferential policies have been introduced to encourage EV purchases amongst potential consumers, only affordability factors have been considered amongst all human security considerations in EV policymaking, leaving other dimensions barely touched.

Human security has been incorporated into China's holistic national security strategy. Protecting its people, in line with the idea of "putting people first" proposed in the country's Scientific Concept of Development, is regarded as the top priority. The deep involvement of EV development in everyday life of ordinary people and meeting people's essential mobility needs adds a human security dimension to the industry's role of serving national security needs. One of the most popular criticisms of the broad human security approach refers to the question of what "is gained by putting the label 'human security' on issues such as the right to education, fair trade practices, or public health challenges". (Krause, 2007, p. 5) Or, to put it simply, does it help solve the problem? This research argues that labelling China's EV development as a human security issue is in line with China's holistic national security strategy. Inspired by the emphasis given to human security in China's national security strategy, this examination of the

EV development through the lens of human security with the help of its analysing utility has the potential of providing insightful ideas in terms of both the dis/empowering factors impacting people's perception of EVs and alternative interpretation of security agency in this transition scenario, which may shed lights on the sustainable development of the industry and thus the attainment of energy security goals on the state level.

Narrow school scholars have questioned the additional analytical traction from labelling sustainable human development as human security. (MacFarlane, 2004, p. 369) Human security concerns act more as normative guidelines than comprehensive analytical frameworks through which energy security in specific situations facing a particular group of people can be systematically assessed. Much work is yet to be done in exploring the analytical utility of human security. Establishing new human energy security assessment frameworks to evaluate individual energy security more systematically can be an essential part of it. The engagement of the human security approach with the development of the new transportation trend constitutes a novel instance of how a broad understanding of human security and its analytical utility can be explored. As noted earlier, the 4As framework has been one of the most widely adopted approaches to national energy security inquiry. In the next chapter, this research will propose its theoretical framework by reinterpreting the four parameters of the As framework from a human-centric perspective in exploring the meaning of EV development for ordinary Chinese people. It may provide evidence that would challenge the criticism facing the broad human security approach by providing evidence for its analytical utility.

Chapter 4 Reinterpret the 4As framework

Introduction

The previous chapter provided reasons why a focus on the human security implications of China's EV development, that is, attention to the ordinary people's concerns, matters in the industry's sustainable development, which is of strategic importance in achieving China's national security goals. This chapter focuses on how to adopt a human security approach to addressing the issue, namely, what analytical framework to adopt. This chapter will propose an alternative paradigm necessary to identify and respond to a broader range of threats with human energy needs as the primary focus in China's EV development context. It will reinterpret the 4As framework with a change of referent object from the state to the people. As noted in Chapter 3, the 4As framework is widely adopted to analyse state-level energy security issues. This chapter will critically review the framework referring to the existing literature regarding the strengths and limitations of its application in energy security research, built on which this chapter will reinterpret the four parameters identified in the As framework (availability, affordability, accessibility and acceptability) with the individual as the referent object and assess the implications of EV development on the individual level. As noted in Chapter 2, the subjective dimension of security is a highlight in the broad school. To further explore the analytical utility of this dimension, this research will introduce the notion of ontological security in the analysis of each parameter of the As framework. As a "focus of research on individual experiences of significant life events" such as experiences of natural disasters (Kent, 2013, p. 211), the ontological security approach will contribute to the exploration of individual experiences of security in the everyday context.

4. 1 Reinterpret the 4As framework

This section addresses why and how the 4As framework provides a solid analytical foundation for this EV-related human security research. The brief introduction of the 4As framework in the previous chapter noted the wide adoption of the framework in energy security research.

This section will overview the discussions on the framework as one of the most widely adopted approaches to energy security within the existing research regarding its advantages and limitations. Building on it, this section will explain why it provides a solid analytical foundation for this research and how the framework will be reinterpreted to address the identified limitations in answering the research questions.

4.1.1 The 4As framework - strengths and limitations in energy security research

Despite the traction gained by the framework evidenced by its wide adoption in energy security research, there are concerns about the limitations of its application in approaching energy security. There are mainly two strands of criticisms within the existing literature concerning its limitations. The first one positions energy security within the security conceptualisation in general and argues that the 4As of energy security fails to address the fundamental questions of security, such as "Security for whom?", "Security for which value?" and "Security from what threats?" (Cherp & Jewell, 2014, p. 415) A concept of security without the identification of the referent object makes little sense. (Buzan et al., 1998) For the APERC research, where the 4As framework was first introduced to energy security studies, the answer to the question of *security for whom* is confusing. Different referent objects are involved when different dimensions are discussed. The analysis of energy security in the research is mainly on the state level, as energy security is defined in the research as "the ability of an economy to guarantee the availability of energy resource supply in a sustainable and timely manner with the energy price being at a level that will not adversely affect the economic performance of the economy". (APERC, p. 6) However, regarding affordability, the research mainly focuses on investment in oil and gas exploitation and energy infrastructure development. (APERC, p. 35) Major energy companies can also be seen as major referent objects as they are subject to world energy price fluctuations. Regarding acceptability, the research examines the environmental impacts of the energy industry. Here the referent object is blurred as all beings would be impacted by environmental changes. Without specifying a referent object, the specific dimensions in the framework lost specific meanings. If the referent object is not confirmed, it is nearly impossible to explore other dimensions of security as different referent objects have different priorities, hold different values and face different security threats.

The lack of clarity in the referent object, as well as the accompanied values to protect and threats to protect from, has led to an unsatisfying result: "this opens pandora's box of possible interpretations, particularly of affordability and acceptability, because it is not clear for whom energy should be affordable or acceptable. (Cherp & Jewell, 2014, p. 417) Scholars adopting the framework, as a result, explain the dimensions in different ways, intentionally or unintentionally, to serve different research purposes. For example, unlike the APERC research, Kruyt et al. (2009) and Hughes (2012) interpret affordability as low bill prices for consumers. In another research, affordability is concerned with government accounts in terms of subsidy levels and import/export balance. (Sharifuddin, 2013) Besides, without enough clarifications and specifications of the four dimensions, the 4As framework has given some scholars a "green light" to propose their own "multi-dimensional" definition simply by adding or modifying dimensions to the framework. (Hughes, 2012; Vivoda, 2010; Sovacool, 2011) As a result, the already slippery and multi-faced concept of energy security (Chester, 2010) becomes even more slippery and multi-faced. (Cherp, 2012, p. 417) There have been attempts to incorporate energy security concerns of different actors in one framework, such as Sovacool and Mukhertjee (2011). However, it is not a robust method, according to Cherp (2012, p. 841), as it blurs the distinct priorities of different referent objects and ignores the importance of contextualisation in energy security analysis.

In response to the first criticism, this research argues that adopting the framework does not stop this research from answering such important security questions as whom and what to protect. As noted in Cherp & Jewell (2014, p. 417), the reason why the question of security for whom was not asked within the framework was likely that the answer was implicitly clear in both classic energy security where the referent objects were oil-importing industrial nations and original health care studies where the referent objects were obviously the clients of health services. This clarity allows measurements and managements of the As. (Cherp & Jewell, 2014, p. 417) Rather than simply reinterpret or modify dimensions to the original 4As leaving the referent object issue undiscussed, this research makes it clear that energy security will only be discussed from the perspective of individual Chinese people. Meanwhile, when discussing the question of security for what value, Cherp and Jewell (2014, pp. 417-418) criticised the lack of connections between energy systems and important social values within the framework as the four parameters refer to the characteristics of energy systems rather than human values. This acts as a reminder for this human-centric research to approach each parameter with the question in mind of what the development really means for every ordinary Chinese people. It

also acts as a reminder that “protecting values of different nations means protecting distinct energy systems of those nations, not energy in general”. (Cherp & Jewell, 2014, p. 418) This research will, as will be illustrated in more detail in the methodological chapter, keep the importance of contextualisation in mind and choose specific metrics in the analysis of each parameter.

The second strand of criticism revolves around selecting parameters and representative indicators or metrics. This strand of criticism concerns approaches to understanding energy security by classification in general. “Classification is not integration. Placing several concerns in one group does not necessarily help us to understand them better or to develop integrated solutions.” (Cherp & Jewell, 2011, p. 8) As a result, the concept becomes “diffuse and often incoherent”. (Sovacool & Mukherjee, 2011, p. 5346) Any categorisation “is always inherently incomplete,” and there are political effects of the categorisation. (Kester, 2018, p. 43) It serves some strategic value: “it enables policy actors to advance very different notions to justify their actions and policies on energy security grounds.” (Sovacool & Mukherjee, 2011, p. 5346) Some other considerations not included in the 4As, such as societal effects and adaptability discussed in other energy security analyses, could also bring valuable insights into collective energy security. (Fouladvand et al., 2022, p. 10) In a similar vein, Cherp and Jewell (2011, p. 8) argue that the classification is “rarely systematically justified: they often seem almost as arbitrary as the lists of energy security concerns which they seek to structure.” Along with social development and changes in domestic and international conditions, more dimensions will continually be added to the list, which makes defining energy security “a Rorschach inkblot test - you can see whatever you want to see in it”. (Sovacool & Mukherjee, 2011, p. 5346)

The classification approach adopted by the 4As framework has been, however, defended by scholars arguing for the polysemic and highly context-dependent nature of energy security discussed in the previous chapter. (Kruyt et al., 2009; Chester, 2010) “The concept has many possible meanings. Energy security may be delineated through multiple dimensions, and it takes on different specificities depending on the country (or continent), timeframe or energy source to which it is applied.” (Chester, 2010, p. 893) The slipperiness of energy security poses difficulties for energy policymaking. (Brennan, 2007, p. 3) Even though classification does not automatically lead to an integrated understanding of energy security challenges, it does, acknowledged by Cherp and Jewell (2011, p. 8), help attract the attention of policymakers and

the public to different aspects of energy security. Metrics and indicators can help find the best energy policy solutions among a menu of different options and competing goals and are the prerequisite for setting targets and evaluating energy policies to actually improve energy security. (Sovacool, 2011, p. 7478) In support of the As framework, Kruyt (2009, p. 2167) argues that the parameters are "by no means isolated categories but subject to a complex interplay". The multi-dimensional conception of energy security, like the 4As, "better reflects the polysemic nature of energy security". (Chester, 2010, p. 893) "Energy markets need to be considered through a multi-dimensional lens which goes beyond the absolute market notions of output and price to include notions such as adequacy of capacity to meet demand, affordability and sustainability" (Chester, 2010, p. 892). In this case, applying multiple indicators leads to a broader understanding. (Kruyt et al., 2009, p. 2166) It is better to "have as a reference point as many of these different meanings as is reasonable" than "adopt one at the risk of excluding others". (Brennan, 2007, p. 3) In response to the criticism of incompleteness and lack of justification, the proponents of the 4As framework highlight its flexibility and adaptability to different research contexts. The framework can be both universal and country-specific. (Yao & Chang, 2014, p. 603) The indicators can be expanded and/or modified in the interpretation of the As depending on the economies' contextual background. (Yao & Chang, 2014, p. 603)

The above analysis on the limitations of the 4As framework's application in energy security research, and more importantly, the responses from scholars referring to its strengths, inform this research on how to maximise the analytical utility of the framework by clarifying the scope of the research, including the referent object, and contextualising the interpretation of the parameters and representative indicators within the unique Chinese context. This will be further discussed in the next chapter on methodology. Apart from the above discussion, this chapter will give two more reasons for choosing the 4As framework for this research regarding its analytical utility in dual-level research and the insights provided by Penchansky and Thomas's healthcare research (1981), which is arguably the origin of the 4As framework. It will be followed by how this research will build its analytical framework by reinterpreting the four parameters.

The analytical utility of the framework in dual-level research constitutes a major reason for this research to choose it as the analytical framework. As discussed in Chapter 3, the 4As framework is well recognised as one of the most widely adopted frameworks to review the

long-term energy security situation of a country and provide guidance for energy policymaking. The framework, at the same time, has been widely used in human-centric studies. As noted in the previous chapter, its origin in healthcare research and incorporation in study areas such as public transport development, food access, education and public services proves its analytical utility in individual-level research. The applicability of the 4As framework in both state-level energy security research and human-related studies proves its potential to contribute to the analysis of this human energy security research in examining the connection of energy security on both levels. The potential of the 4As framework in the dual-level analysis perfectly meets the goal of this research to explore the human security dimension of China's EV development and compare it with the industry's "success" achieved on the state level.

Unlike states, human beings have different security needs and thus face different security threats. In this sense, this research aims to propose an analytical framework that engages with ordinary people and helps explore their life stories. Apart from its adoption in energy security-related research, applying the framework in human-centric studies provides insights into achieving the goal. One example is the adoption of the As framework in Penchansky and Thomas's healthcare research (1981). It has been used to examine the degree of "fit between the patient and the healthcare system" (Penchansky & Thomas, 1981, p. 127). It reflects the degree to which patients can receive the service whenever and wherever they need it. The logic regarding services provided and received perfectly fits in the examination of energy-powered mobility services needed by ordinary people in their daily lives.

Within the context of this research, states secure access to energy resources, especially fossil fuels, which is shown in how energy security is broadly defined (uninterrupted availability of energy sources at an affordable price). Like states need oil to function and develop, energy security for individuals concerns secure access to vital energy services and goods needed for their daily activities. This logic echoes the conception of energy security by Winzer (2012), who transformed the referent from the supply of resources to the services. Winzer (2012, p. 38) extends the conceptualisation of the 4As framework by adding the continuity of service supplies as an impact measure, as it is not the primary energy source but the service that ordinary people need. Informed by the three logics of Ciuta (2010), the needs include both the fundamental ones for survival, which echoes the traditional security conception that emphasises existential threats, and those required for the full engagement in modern life and achievement of their potential as human beings, which in the language of human security are

freedom from want and *freedom to live in dignity*. Even though the objects and contexts of this research are different from the original healthcare research, the logics applied are similar and straightforward: human security in the EV context is about how people's demand for necessary mobility services has been achieved and to what extent their mobility and other related needs are met with the EV development. The insightful perspectives provided by Penchansky and Thomas's work constitute the other reason why the 4As framework will provide a solid analytical foundation for this research.

4.2.2 Reinterpret the 4As framework

Availability in Penchansky and Thomas's work reflects the relationship between the volume and type of the existing services and resources and clients' volume and type of needs. If this logic is applied to human security within the EV context, availability indicates the relationship between the available amount and types of services EVs provide and people's mobility needs. Along with the changes in how the car is powered comes the transformative characteristic of EVs and changes in services they provide for people in meeting their needs. Some common problems amongst most EVs, such as the range problems caused by battery storage, mean that people with specific needs, such as driving long distances, are left with fewer choices. The unstable performance of EVs in various weather conditions puts more limits on their capability of providing people with necessary mobility services.

It is necessary to clarify, as will be illustrated later in detail in the following chapters, the definition of the availability of the EV in this context against its access. Whereas availability looks at the characteristics of the EV service itself, its access deals with facilitating factors and barriers shaping people's access to the available EV services, including financial factors (***affordability***) and other factors (***accessibility***), such as access to charging facilities.

In the EV context, access barriers can be diverse and more complicated, covering a range of financial and non-financial factors. ***Affordability*** looks into financial ones. Many factors may affect how affordable healthcare is to people in need, such as existing health insurance, patients' income level, and service providers' insurance or deposit requirement. (Penchasky & Thomas, p. 128) The logic here is simple: affordability refers to the relationship between the prices of

healthcare services and patients' ability and willingness to pay for the service. Applying the logic to this research, affordability deals with the relationship between the cost of the EV, including recharge and maintenance, and people's ability and willingness to pay for them. Some factors may affect affordability, such as people's income, their perception of the vehicle's value, and government subsidy policy, which has been a significant step taken by the Chinese government in promoting EV uptake but has proven unsustainable. Affordability provides a lens through which to explore how financial factors shape the human security implications of EV adoption.

Accessibility refers to "the relationship between the location of supply and the location of clients". (Penchansky & Thomas, p. 128) It concerns the time and physical distance between the service and the patient in need of the service. Factors concerning accessibility include clients' transportation resources, travel distance, travel time, and cost. (Penchansky & Thomas, p. 128) In this research, accessibility deals with non-financial factors that influence people's access to electrified automobility. It is interesting to see in China that the shift to EVs has been the solution for many to maintain mobility due to harsh policies on traditional vehicles, such as limitations on acquiring plate numbers and access to downtown areas in major cities. The introduction of EVs ensured many people access necessary transportation services. However, it is by no means accessible for the majority of the population. Amongst access barriers that will be covered in Chapter 8, one major constraint is people's lack of access to necessary charging infrastructures, both public and private. Compared with ubiquitous gas stations, the lack of charging facilities available for people at home, at work and in other public spaces can increase the cost and cause inconvenience for EV users.

As noted earlier, in the APERC research and almost all official energy reports, ***acceptability*** is directly linked to the ecological environment. Acceptability equals environmental acceptability. How environmental sustainability is impacted is the only consideration concerning acceptability in energy security research. It is widely believed that the transformation of the automobile industry is essential to fight climate change, which is seen as an existential threat facing human beings. (IEA, 2016) The environmental impacts of the development of the EV industry in China are complicated[21]. Instead of figuring out potential environmental impacts of EV development, the environmental acceptability in this research will look at how the

[21] One primary reason is that electricity is still generated primarily from burning coal in China. In their analysis of the environmental implications of EVs, Huo et al. (2010) found that while EVs may not offer much benefit in reducing CO2 emissions with the current electricity generation mix, they may do so in the future.

environmental benefits of EV development are perceived amongst Chinese people and if the adoption of EVs makes them feel more secure from environmental degradation.

According to Penchansky and Thomas (p. 129), ***acceptability*** reflects "the relationship of clients' attitudes about personal and practice characteristics of providers to the actual characteristics of existing providers". That is, the relationship between clients' attitudes towards the service they receive and the service itself. Apart from the environment dimension, safety is another keyword that has been widely discussed amongst the Chinese public regarding whether EVs are safe enough at this stage of development. In fact, as will be examined in detail in the acceptability chapter, acceptability in this research emphasises the existential security considerations brought by EV development in China. Existing literature and data collected in this research have pointed to two areas of EV development - environment implications and driving safety- as physical security related. This research will thus address acceptability from these two angles, observe the perceptions of ordinary Chinese people regarding how secure EVs are, and explore the construction of their security perceptions. Table 4.1 summarises the four parameters under the As framework and major considerations incorporated in each parameter.

Table 4.1 Summary of the As and major considerations.

As	**Major considerations**
Availability	With a focus on the functionality of the car itself in meeting people's security needs, availability addresses how the empowering factors of automobility will be impacted by the changes brought by the transformation, such as the equipped EV batteries that make the car more temperature sensitive compared with its traditional counterpart.
Affordability	Affordability examines the financial factors impacting people's access to automobility, including the financial incentive policies and the introduction of budget EVs and their implications on Chinese people's access to mobility services essential to their daily lives.
Accessibility	Accessibility deals with other issues concerning access, such as EV charging facilities.

Acceptability	Acceptability emphasises the existential security considerations brought by EV development in China - environment and safety.

By reinterpreting the four parameters through engaging with the real-life stories of ordinary Chinese people, this research will explore from an ordinary people's perspective how the EV introduction has been changing their lives with security implications. At the same time, as noted earlier, subjectivity is an important dimension of human security. It concerns the psychological factors that shape people's perceptions of their security. "For most people today, a feeling of insecurity arises more from worries about daily life than from the dread of a cataclysmic world event." (UNDP, 1994, p. 3) A thorough understanding of EV development from a human-centric perspective cannot be achieved by focusing only on technical and economic factors as most experts do. (Nelson et al., 2021) Automobiles are becoming increasingly essential in meeting people's mobility needs, which are closely related to people's well-being and empowerment in a broad sense. As mobility tools that provide mobility services to meet people's essential daily mobility needs, cars appeal to people thanks to both rational and utilitarian factors and symbolic meanings. (Kent, 2016) In order to better illustrate the subjective dimension of human security implications in addition to the utilitarian factors in meeting people's essential mobility needs in the context of automobile transformation, the next section will introduce the concept of ontological security. "Automobiliy's appeal is its function as ontologically securing in modern life." (Kent, 2016, p. 2) The ontological approach provides an array of angles to examine individual experiences of security in an everyday context. (Kent, 2013, p. 215) The following section will explain how the ontological security approach goes beyond the utility functionality/psychological-symbolism dichotomy of automobility analysis and offers a comprehensive explanation of the car's appeal in the everyday context, which will explain why the approach provides valuable perspectives in interpreting the parameters of the As framework in this research.

4.2 Automobility, ontological security, and human security

This section will explain why ontological security is helpful in exploring the four parameters of the As framework. By understanding people's attachments, both functional and emotional, to cars, the ontological security approach facilitates the understanding of the ontologically empowering nature of automobiles. It lays the foundation for examining the human security implications of the automobility transformation. This section will introduce ontological security within the human security narrative to fix the limitations of the popular utility functionality/psychological-symbolism dichotomy in the current car research. More importantly, this section will build a complementary analytical tool of ontological security with three key indicators (protection, autonomy, and social acceptance) in the analysis of changes in automobility brought by the car transformation, which will facilitate a better illustration of the four parameters of the As framework in the everyday security context.

This research addresses the transformation in human mobility made possible by the electrification of private passenger cars. Before examining these changes, it is essential to note that cars play a significant role in humanity beyond a means of transport and profoundly influence human security. How to explain the dominance of car-based mobility in human mobility? More specifically, how do the services provided by automobility make people more secure?[22]

The services afforded by cars are often depicted in both utilitarian and psychological forms. (Kent, 2016) With its strongly embedded symbolic meanings, the car attracts people with both its instrumental functions, such as speed, flexibility and convenience and its psychological appeal of fulfilling people's symbolic and emotional needs, such as the feeling of power and superiority. (Steg, 2005, p. 148) The private car is deeply engrained in how people make sense of and navigate their streets and places in the world. (Kent, 2013) "Cars are above all machines that move people, but they do so in many senses of the word." (Sheller, 2004, p. 221) Both forms of services enable, enrich, and empower people and explain the popularity and endurance of private car use. The following section will explain that the empowering feature of cars can be understood with an ontological security approach.

[22] This does not imply that cars always make people more secure. The insecurities caused by car travelling have been primarily discussed in the strand of research that will be noted in footnote 3 of this chapter.

Ontological security is a psychoanalytical term introduced by R.D. Laing in his book The Divided Self (1960). For Laing, to be ontologically secure is to "have a sense of his presence in the world as a real, alive, whole, and, in a temporal sense, a continuous person" (1960, p. 39). Ontology was seen by Laing as the "best adverbial or adjectival derivative of being". (Laing, 1960, p. 39) Ontological security can thus be understood as "the security of the self". (Mitzen, 2006, p. 341) Without ontological security, the individual will be overwhelmed by anxieties that reach the very roots of the individual's coherent sense of being in the world. (Laing, 1960, p. 39) Ontological security thus is described as a "marginalised dimension" within the human security literature:

> By Human Security, I mean the right of people to live in freedom and dignity, free from fear and want. Ontological security, at its most basic, refers to the psychological security of the self. The argument is therefore that the right of people to live in freedom and dignity is based on the prior existence of a stable self, which is able to engage and interact with others. If individuals lack ontological security, they are unable to establish relations of basic trust with other individuals and, consequently, are unlikely to be able to live in freedom and dignity, free from fear and want. Human Security, therefore, presupposes ontological security. (Shani, 2017, p. 277)

From the perspective of human mobility security, ontological security is argued to be able to provide an ideal framework to go beyond the convenient way (the dichotomy of utilitarian functions/psychological appeals) of understanding automobility's endurance in the existing research and address people's seeking of security through cars in a thoroughgoing way. Efforts have been made by scholars to figure out people's attachments to cars, which compared with other commodities people consume, such as houses and clothes, have been given disproportionately less attention in the social science literature (Miller, 2001), despite as will be shown later, their strong human security implications. Realising the social problems brought by massive car uptakes,[23] including issues of human security consequences such as air

[23] Within the limited volume on the social implications of increasing automobile uptake, there is a prevalent reversed attitude developed by some academics towards cars and car culture in general with a theoretical critique of modernity. (Pink et al., 2019, p. 90) This set of research critically examines the erosion of and damages to "public goods" caused by the car culture. (Sheller, 2004) Examples are environmental concerns (Graves & Brow, 1997; Nadis & Mackenzie, 1993), fatalities and injuries (Whitelegg, 1997; Whitelock, 1971, Wolf, 1996), human health such as a sedentary lifestyle caused by frequent car use (Dora & Philips, 2000) and fragmented social practices. (Sheller & Urry, 2000)

pollution, a strand of research stands back from the disposition of critique (Dawson, 2015, p. 17) and seeks to explain the motivations behind private car use, that is, how the affordance of motor cars has ontologically empowered people. By doing so, more effective and targeted policy measures can be implemented in promoting alternative transport modes so that reductions in the volume of cars might be achieved. (Steg, 2005) This strand of research reflects the lack of empathy in the dominant anti-car discourses, even though the inquiry revolves around human death on the road and the pollution of the human living environment. (Miller, 2001, p. 9) "The object and the subject are set radically apart", cars and human beings are portrayed mainly "as antagonists where humanity is always victims". (Miller, 2001, p. 9) Cars are not merely a means of transport for utilitarian purposes. As "symbols for personal freedom", cars are depicted as an empowering tool, the ownership of which means not only independent mobility but also choices and free will. (D'Costa, 2013) It is reflected in the appreciation and admiration towards cars from the mass public in popular culture, where the speed, streamlined steel body, and even the chauffeur at service combined connotes a good life. (Miller, 2001, p. 8) "With the open road before you, you can go anywhere—from behind the wheel you really take control of your destiny." (D'Costa, 2013) This strand of research discusses the human security implications of car use from two perspectives: its utility functions and affective-symbolic appeal.[24] Most existing research adopts this dominant dichotomy of "rational instrumental/symbolic affective motives", which continues to filter through transport research and policymaking. (Kent, 2016, p. 46) However, the characteristics of private car use and people's attachment to them cannot be neatly classified into utilitarian and symbolic manners. These two dimensions are "simultaneously perceived and practiced", as the private car use in this modern world relates "as much to rational decisions to manage time as to emotional yearnings for freedom, control and social acceptance". (Kent, 2016, p. 46)

The introduction of the ontological security approach in car research helps achieve a coherent and comprehensive understanding of cars from a human security perspective by covering both sets of factors in analysing the services afforded by private car use (Kent, 2016, p. 47) without falling into the dichotomy trap. Understanding the ontologically empowering nature of

[24] The functions and services provided by cars are mainly classified into two groups: physical functions in meeting people's rational and utilitarian needs in terms of travel time, costs, physical efforts, and flexibility (Brownstone & Small, 2005); and the affective-symbolic appeal of automobiles in fulfilling people's symbolic and emotional needs, such as feelings of status, safety, and autonomy. (Steg, 2005, p. 147; Kent, 2016)

automobiles helps lay the foundation for examining the human security implications of EV development. Echoing the broad understanding of human security, ontological security suggests that "people need more than just adequate sustenance and shelter to live happy and fulfilled lives". (Hiscock et al., 2001, p. 50) One needs to feel secure and avoid anxiety in day-to-day life to flourish. (Kent, 2013, p. 213) The affordances of automobiles help people attain the security of self with their instrumental properties and emotional appeal. The driving force for individual car use is partly underpinned by a "culturally inculcated" yet "individually experienced" desire for security living in a modern society that increasingly features insecurity. (Kent, 2016, p. 37) The concept of ontological security, which finds its conventional use in psychiatry in describing people's fundamental desires for security, can be adapted to illustrate an individual's attachment to cars. (Kent, 2016, p. 37) The EV development will bring changes to the characteristics of automobility. More importantly, it will shape how people navigate and experience life in a protected and empowered way offered by automobiles. The implications can be understood from the perspective of ontological security.

Amongst the limited literature on illustrations of the ontological implications of cars and automobility in the context of our mundane lives,[25] Hiscock et al. (2002) and Kent (2013, 2016) stand out. Hiscock et al. (2002) build on the cocoon concept and see the car as providing people with protection, autonomy, and prestige, which are necessary to attain ontological security. Cars provide people with protection from undesirable events and surroundings, autonomy as people get access to controlling their mobility in a more convenient and reliable way, and prestige as cars are often markers for high-status attributes such as having a high income, an exciting life, and masculinity. (Hiscock et al., 2002, p. 119, 130) Building on Hiscock et al. (2002) and treating cars as the provider of "autonomous and predictable mobility" in addition to a material object, Kent (2013, 2016) proposes three refined and more inclusive indicators in a more systematic manner to explore the ontological security implications of car use: autonomy, predictability, and acceptance. The sense of mastery, or "knowing", that comes from routine and predictability relates directly to autonomy and control, giving people freedom from timetables, fixed routes, and moving independently. (Kent, 2016, pp. 43-44) Along with the sense of mastery, a sense of acceptance, that is, a positive self-image regarding the collective

[25] Even though ontological security is a psychoanalytical term for schizophrenia, it has been adopted in many human security-related intellectual inquiries. For example, Hawkins and Maurer (2011) applied the concept of ontological security to study survivors of Hurricanes Katrina and Rita. It has also been employed to examine experiences of migration. (Hinton et al. 2009)

cultural society, constitutes an equally important pillar underpinning one's ontological security. (Kent, 2016, p. 44) These three components are intricately linked imperatives afforded by private car use for people in the pursuit of ontological security. (Kent, 2016, p. 42) Based on the two studies mentioned above, the following part of this section will look at three ontological security indicators (protection, autonomy, and acceptance)[26] that are closely related to the analysis of automobility and, more importantly, reflect significant human security implications of EV development.

Protection

Anthony Giddens suggests that the need for individuals to feel protected emerges early on as an infant and is stronger than physical needs such as to satisfy hunger and thirst. (Hiscock et al., 2002, p. 120) The concept of "cocoon" is closely linked to ontological security narratives. According to Anthony Giddens (1991, pp. 38-9), ontological security refers to a person's "fundamental sense of safety" and "basic trust" living in the world. Ontologically secure individuals are able to exercise agency and flourish because of the existence of trust as a "protective cocoon" that shields them from threats and risks to their physical or psychological integrity associated with their mundane everyday life. (Giddens, 1991, p. 4) This protective cocoon is carried around by all normal individuals as the means whereby they can get on with the affairs of day-to-day life. (Shani, p. 285) It is interesting to notice that cars are also frequently depicted as a cocoon in existing driving research – a buffer between the driver and the outside world against unpleasant sensory experiences. (Dawson, 2015; Pink, 2019, p. 98) Cars provide a sanctuary, protective, and comfortable environment for commuting and holidays. (Urry, 2000, pp. 8-9; Mom, 2014, p. 38) They protect people and give them both physical and psychological security. Cars protect people from undesirable weather conditions, privacy invasion and attacks from strangers compared with public transport, to name but a few. The cocoon concept frequently used in the examination of both ontological security and automobility provides more connection between private car adoption and the ontological security experienced by people. The protection people are provided by cars has substantial

[26] The difficulty of defining and operationalising ontological security due to its inherent subjectivity has been recognised in both Hiscock et al. (2001, p. 52) and Kent (2013, p. 216). As noted in Kent (2013, p. 217), the purpose of identifying the key indicators is to "break the concept down into operational themes which can then be addressed through reference to empirical data".

human security implications, and the changes brought by EVs provide new angles to perceive them.

Autonomy

Autonomy is another essential experience of ontological security. "Ontological security fosters the development of the self by providing enough invulnerability for a person to exercise autonomy." (Hiscock et al., 2002, p. 120) Autonomy confers empowerment and freedom, which are core values upheld by human security scholars. Cars afford autonomy by empowering people with the means to travel wherever they want in a variety of forms: immediacy, frequency, and complexity. (Hiscock et al., 2002, p. 121; p.126) People can hit the road immediately with no waiting or prolonged travel time compared with the infrequency and less reliability of public transport. Cars also make journeys smoother and usually less time-consuming when complex multimode journeys are necessary if travelling by public transport. Besides alleviating the travel time limit, cars empower and free people by offering the choice of travelling to a wider variety of destinations. Cars provided superior access to out-of-town better-quality facilities and activities than those available locally. (Hiscock et al., 2002, p. 127) The speed advantage of car mobility makes it possible to travel long distances within a much shorter time (and with much more convenience) compared with other transport modes. As a result, the boundaries of human activities, not only long-distance travelling but also everyday life, have been expanded. [27]

All of the above functional features demonstrating the enormous power of car-based mobility and the freedom for people to choose where to live and where to work can be translated from a psychological perspective into the autonomy felt and enjoyed by the car user. The incredible "muscle" of cars confer people with power, control and free will. In a 1994 Jeep commercial, the vehicle, apart from being a cocoon for protection, became a symbol of people exercising

[27] Some even argue that car adoption constitutes a key driver of suburbanisation. (Kopecky & Suen, 2004) Even though some regard the idea as a rushed and unwarranted conclusion by arguing that comparing life before and after the car, there was very little increase in mobility in terms of the frequency of mundane activities such as grocery shopping (Wolf, 1996), it is still important to know that the speed of cars enables us to vastly reduce the commute time and get more things done.

their autonomy, as the car was able to plough through several feet of snow and get the driver wherever he/she wanted even in the face of extreme weather conditions as such. [Figure 4.1] The convenience, reliability and more choices provided by cars temporally and spatially confer people feelings of control over their lives, which helps establish their self-identity and enhance their autonomy. (Hiscock et al., 2002, p. 126)

Figure 4.1 Jeep. (1994). Snow Covered. Screenshot of the commercial. https://www.youtube.com/watch?v=p_CvNP64g4g [Accessed 07/06/2021].

Adding to Hiscock et al. (2002)'s list, Kent (2016, p. 42) proposed the element of predictability to the equation. Autonomy can also be reflected in how well people are able to predict their daily mobility routine and their work and home environments in a broad sense. This echoes the work of the Commission on Global Governance (1995, pp. 80-81) that advocated an expanded concept of human security that included "protection from sudden and harmful disruptions in the patterns of daily life". The consistency of the daily routines and living environments is essential for people to be ontologically secure as they inoculate people against the existential anxiety caused by the unknown. (Giddens, 1991, p. 39). Routine makes security. Since the automobile transformation features changes in not only how the car is powered but also its functionality and access, which may cause uncertainties, how people's perceptions of car-related autonomy will be impacted constitutes a focus of analysis in this research.

Social acceptance

Apart from the sense of being protected and showing mastery, ontological security also requires the self to be seen positively in relation to others. (Hickhock et al., 2002, p. 120) Rather than a merely technical action about speed, distance, and time, driving is inherently a social action as drivers relate to and interact with each other, with pedestrians and cyclists, involving the "interpretation of cultural signs and signals". (Vinkhuyzen & Cefkin, 2016, p. 524) The reflexive nature of ontological security means "the individual pursues it in accordance with his or her interpretation of what society defines a secure life to be". (Kent, 2016, p. 44) Being ontologically secure is an individually negotiated experience; seeking a socially accepted way of living as another pillar of ontological security becomes essential in rationalising personal sensations and desires regarding collective social and cultural patterns. (Kent, 2016, p. 44)

A sense of pride and prestige intrinsically contributes to a stronger sense of ontological security. "Sustaining feelings of pride has effects which go further than simply protecting or enhancing self-identity, because of the intrinsic relations between the coherence of the self, its relations to others, and the sense of ontological security more generally." (Giddens, 1991, p. 66) To be ontologically secure, we need to think positively of ourselves. (Kent, 2013, p. 238) Apart from the cost, which is an important measure of status, the types of cars, such as vintage cars, also help create one's public profile. (Strokes & Hallett, 1992, p. 178) Due to its visibility and the relatively high cost of imitation, the car has become "the most psychologically expressive object that has so far been devised". (Marsh & Collett, 1986 in Strokes & Hallett, 1992, p. 178) To prove that you are what you drive, Motorpoint (2017) conducted an interesting study on the general impression of the UK public on people driving different cars. The results showed coherency. For example, the UK public believed that the drivers of Mercedes were likely to be older gentlemen who had enjoyed the finer things in life. In contrast, a young, casually dressed female aged between 26 and 35 was more likely to be the owner of a Fiat. As one's expensive asset, cars, especially those of premium brands, provide "a mobile status symbol for the rest of the world to see". (Stokes & Hallett, 1992) People use cars partly because of the prestige and other socially desirable attributes they provide for the world to see, even at times when it is not the most cost-effective mobility option. (Hiscock et al., 2002, p. 121)

Apart from the pride cars offer as a physical object, the prestige of private car use also comes from its psychologically empowering feature embedded in its fast speed. This by no means indicates that car travelling is always the most efficient option. However, it is often the case that when looking back on those who are slower on the road, the driver and passengers in a car are enabled by the speed advantage of the car travelling to feel proud and even superior in traffic.

Acceptance also entails a sense of belonging and approval. Bauman (2010, p. 16) identified two "human urges or longings": one is the urge for individualisation/uniqueness/self-assertion, which is related to the desire for autonomy; the other is the longing to be part of a greater whole, which can be understood as the lust for a sense of belonging:

> We may say, ultimately: a need for the security of holding hands, and for the freedom to let them go… Or, to look at the same emotional coupling and dilemma from the opposite side: the fear of standing out and the horror of the self's dissolution. (Bauman, 2010, p. 16)

To be ontologically secure, one constantly yearns for not only autonomy but also a sense of belonging to others and gaining their approval. (Kent, 2016, p. 45) Car ownership works to build a sense of belonging and inclusion. (Roes et al., 2009) Private car use helps people not be "the pitiful other" who must use public transport in the hot sun or the pouring rain. By making the transport routine more manageable and safer, cars provide their users with more opportunities for employment, education, and social participation. (McCray & Brais, 2007).

It is important to note that the indicators mentioned above cannot be universally applied to every circumstance and are not equally desired by every individual, as it has a lot to do with each subject and their backgrounds, such as their household situation (whether they are responsible for transporting children), the values they uphold (their environmental awareness and thoughts on consumerism), and their social-spatial conditions (the commute distances, leisure pursuits, and the level of convenience of local public transport). (Hiscock et al., 2002, p. 133) However, these indicators have been proved in existing research to profoundly influence people's experiences of ontological security. It is also important to note that different aspects of ontological security are often connected. (Hiscock et al., 2002, p. 129) As will be

examined in detail later, electrification comes along with the intellectualisation process, which brings services unimaginable before. At the same time, some existing common problems amongst most EVs, such as the range problems caused by battery storage, mean that people with specific needs, such as driving long distances, are left with fewer choices. The unstable performance of EVs in various weather conditions puts more limits on their capability of providing people with necessary mobility services. All these changes will work together to shape people's perceptions of EVs.

Conclusion

Within the discussion of social and cultural life, the car has been surprisingly largely absent (Miller, 2001) despite its ubiquity and essentiality in meeting people's ever-growing mobility needs and shaping who we are. This chapter explained why and how the reinterpretation of the 4As framework would contribute to exploring the human security implications of China's EV development. By reinterpreting the 4As framework with individuals as referent objects and drawing on the insights from the ontological security approach, this research will explore how the development of the EV industry has caused human-related security issues in a detailed and comprehensive manner. This research will contribute to the existing human security literature by shedding some light on the applicability of the broad understanding of human security and providing more evidence to demonstrate that "the positive framing of human security has both analytical insights and valuable policy implications" (Newman, 2021, p. 2) It can help provide an in-depth analysis of energy security facing human beings in new energy scenarios.

The 4As framework, together with indicators offered by the ontological security approach, will help build a framework of human security that features the involvement of ordinary people. This aim will be achieved by transforming the referent object from the state to the people, reinterpreting the A parameters in the context of the daily lives of ordinary Chinese people, and incorporating the subjective considerations of security in the analysis drawing on the insights from ontological security. It will also be achieved through data collection and analysis that gives people a chance to stand up and speak for themselves. "No matter which topic is addressed, a guiding principle of the human security approach is that it requires understanding the particular threats experienced by particular groups of people, as well as the participation of those people in the analysis process." (Gómez & Gasper, 2013, p. 2) Participation of the people

in the research process is another form of human empowerment. It is a major methodological consideration in this research. The next chapter will address how collecting and analysing data from popular Chinese social media platforms will help achieve the goal of capturing the real-life experience of ordinary Chinese people and incorporating their voices in the exploration of this human security puzzle.

Chapter 5 Research methodology

Introduction

The previous chapter discussed in detail the analytical framework that will help probe into how the lives of ordinary Chinese people will be impacted by the development of EVs and the accompanying human security implications. This chapter will explain how data will be collected and analysed on Chinese social media platforms with the aim of engaging with the real-life experiences of ordinary Chinese people. Social media provides a tool to observe people and their interactions with EVs in an unobtrusive environment and catch their thoughts and feelings. From a methodological perspective, this human security research welcomes "more inclusive dialogue" between the state and the people and the involvement of the ordinary people as contributors to the security dialogue. "Individuals have to be empowered to take control of their environment." It requires a bottom-up process of social change that individuals are to "become stakeholders in political, economic, and social processes that affect them." (Krause, 2007, p. 19) The user-empowering and enabling features of social media are in line with this human security research that emphasises the role of people.

This chapter will start with an explanation of sourcing data on social media in Section 5.1. To collect and analyse data following a rigorous guideline, this research will adopt the qualitative research method of netnography developed by Kozinets (1997, 1998, 2002, 2010, 2015, 2016, 2020) and engage with the online sphere of the daily life of the ordinary Chinese people. Section 5.2 will introduce netnography, including its emergence, evolution, characteristics and netnographic procedures, with particular attention to its strengths and weaknesses that are relevant to this research compared to in-person qualitative techniques. It will be followed by a discussion on why this research has adopted it for data collection and analysis. The chapter will proceed with an illustration of the research process in Section 5.3, emphasising data collection and analysis. This section will justify the decisions made during the process in terms of the forums identified most appropriate to observe and understand the impacts of EV development on Chinese people, the types and amount of data collected, saved, and pursued, and how the

data was analysed. The chapter will end with thoughts on research ethics, the recognition of some methodological limitations of the research, and some coping strategies.

5.1 Data collection on social media

The data collection of this research aims to capture the real experiences and stories of the Chinese people. Social-psychological and demographic barriers tell stories that cannot be known solely by hardcore statistics. Instead of looking for a list of factors, be it economic, technological, or demographical, which affect people's decision-making on EV adoption, with an aim to promote EVs, this research intends to draw on the real-life experience of ordinary people and depict a picture as authentic as possible of the implications of this transformation on people's everyday life and well-being. Social media provides a tool to observe people and their interactions with EVs in an unobtrusive environment and catch their thoughts and feelings. In the contemporary world, many life activities, including personal and social conversations, shopping, working, and other activities that previously relied on physical proximity, are now conducted via the Internet. It is therefore questioned in qualitative research data collection if it is still necessary for researchers to sit in the same room or physical space with participants for meaningful conversations and valuable fieldwork. (Salmons, 2017, p. 177) The online world provides space for qualitative researchers to "adapt and re-invent qualitative approaches to study patterns of activity or behaviours… observe how professional networking occurs in an online community or communicate online with a participant located in another part of the world." (Salmons, 2017, p. 177)

The user-empowering and enabling features of social media are in line with this human security research that emphasises the role of people. Social media represents self-empowerment and enabling. It is a collective grassroots communication phenomenon that redistributes power based on new mediagenic metrics. (Kozinets, 2020, p. 12) It provides a platform for ordinary people to get their voices heard and communicate their needs. Compared with traditional mass media where the general public is the audience, social media makes the public both the audience and content creators. It enables the "normal people" instead of media professionals to create original media content in texts, photos, and videos, share and participate in social networking as "multimedia producers". (Stefanone et al., 2010, p. 510) How individuals

perceive their role in the contemporary media environment has changed accordingly. (Stefanone et al., 2010, p. 509) “Rather than simply being targeted by mediated messages, they can see themselves as protagonists of mediated narratives who actively integrate themselves into a complex media ecosystem.” (Stefanone et al., 2010, p. 509) Social media's communication and interactive features provide qualitative researchers with opportunities to observe users’ interactions and hear their thoughts and opinions. The non-intrusive material posted on social media is valuable for building a comprehensive understanding of a specific topic covering diverse perspectives and experiences. (Salmons, 2017, p. 177)

The ethnography adapted to the study of online communities is called online ethnography. (Rahm-Skågeby, 2011, p. 411) It is understood as a logical evolution of ethnography. (Bluestone, 2020) As people constantly upgrade their ways of experiencing, expressing, and engaging with the world thanks to the constantly emerging communication technology innovations and possibilities, an evolving process is also happening in ethnographic research practices that are likewise intertwined with the same set of visual technologies and shifting the ways of seeing, sensing, learning, and creating ethnographic knowledge. (Pink, 2021) The core of ethnography is for researchers to embed themselves in their participants’ environment instead of bringing respondents to the researcher, so they can observe their natural experiences as and when they happen, resulting in the revelation of more profound insights. In this digital world we live in, where everybody has a connected device in their pocket, the ethnographic field sites are also transforming to “not only cross physical localities but also traverse the digital and material worlds and temporalities that are brought together as everyday lives are lived.” (Pink, 2021, p. 3) The online space has become the new field site for researchers to get involved in people's natural environment in a non-intrusive way, even though the researcher can be far away from the target audience physically and temporally. In this sense, it is “difficult to be a contemporary ethnographer without engaging with digital media, technologies and the social, material and infrastructural environments and practices associated with them.” (Pink, 2021, p. 3)

Netnography is known for “its axiological orientation residing in recognition of online social experiences”. (Morais et al., 2020, p. 441) As will be explained in the next section, netnography distinguishes itself from other forms of online ethnography by its specific and pragmatic techniques in investigating online traces. Designed to help make sense of the online communication system and how people interact with and within it (Kozinets, 2020, p. 5),

netnography provides an ideal and practical tool for exploring the online social experience. Netnography has been evolving along with the advances in data transmission technology (Morais et al., 2020, p. 441). The dramatic evolution of social media and its emergence as an influential commonplace have been the highlight in recent years. (Kozinets, 2020, p. 8) The following section will introduce netnography, its characteristics, strengths and weaknesses, and how it will help guide this research in studying Chinese people's EV experiences online.

5.2 Netnography

5.2.1 Definition and characteristics of netnography

Netnography is a specified form of ethnography “on the Internet” dedicated to studying “cultures and communities emerging through computer-mediated communications” by adapting ethnographic research techniques. (Kozinets, 2002, p. 62) It is the kind of ethnographic research conducted in an online space where researchers access and observe the expressions, behaviours and interactions of a particular culture or subgroup in their natural environment. Kozinets coined the term in 1997. (Kozinets, 1997) It is an interpretive method devised specifically to investigate cyberculture, virtual community, and a wide range of consumer experiences manifesting in and through them. (Kozinets, 1998) Allowing the researcher to “comprehensively cover the entire social context of 'life on the screen'“, netnography is claimed to be “a necessary part, if not the major part, of any explication of consumer behaviour manifested in a pure cyberculture or pure virtual community context”. (Kozinets, 1998, p. 367) Since his preliminary writings in the 1990s, Kozinets has moved towards a more detailed, comprehensive, and justificatory definition of netnography over the years. It was later rephrased as “a specialised form of ethnography adapted to the unique computer-mediated contingencies of today's social worlds” in Kozinets (2010, p. 1). With the thriving of social media in recent years, Kozinets (2020, p. 5) had a “near total reboot” in the latest Netnography edition by refocusing on social media's vital and ever-changing realities. Netnography is most recently understood as “a form of qualitative research that seeks to understand the cultural experiences that encompass and are reflected within the traces, practices, networks and systems of social media.” (Kozintes, 2020, p. 14) The qualitative research method “offers researchers a detailed and specific approach to conducting qualitative research using

social media as the basis of its datasets". (Kozinets, 2020, p. 5) The operations in netnography have been constantly refined and updated. For example, as will be explained later in more detail, four of the five criteria used in data-selection operations in netnographic investigation, namely relevance, activity, interactivity, and richness, were first introduced in Kozinets (2002), while the diversity criterion was published, and substantiality criterion was removed in Kozinets (2010).

Netnography has often been confused with or used interchangeably with terms such as virtual ethnography (Toledano, 2017, p. 599) and digital ethnography (DJS Research, n.d.). According to Kozinets (2020, p. 14), netnography is not "merely ethnography done online". It is distinguished from other similar notions [28]such as digital ethnography by its focus on online traces, specificity, and pragmatism. (Kozinets, 2020) "Netnography is different from other methods because it uses specific techniques and a pragmatic approach to investigate online traces." (Kozinets, 2020, p. 2)

Netnography is centred on the study of online traces. (Kozinets, 2020, p. 16) Online traces are the information left behind by people posting text, images, and videos, commenting, sharing, and doing other activities online. (Kozinets, 2020, p. 16) One feature of online traces is that they are "accessible online to anonymous or networked others", which makes them "a free form of public social information from which we all draw benefits…one of the benefits is the ability to research them." (Kozinets, 2020, p. 16) Collecting and analysing online traces is "a key distinguishing element" of netnography, even though some netnographies extend beyond online traces to other forms of data collection and creation, such as in-person interviewing, online interviewing, mobile interviewing, and mobile recording. (Kozinets, 2020, p. 16) "For over twenty years, collecting and interpreting these [online] traces has formed the core of a netnographic investigation." (Kozinets, 2020, p. 16)

Like other forms of ethnography, netnography values using techniques to immerse in a culture. (Kozinets, 2020, p. 2). However, general ethnography "does not stipulate a universal sequence of data collection methods". (Arnould & Wallendorf, 1994, p. 485) Instead, the operations of data collection are dictated by the "nature of the phenomenon", researchers' prior

[28] Kozinets (2020, p. 6) lists similar terms: 'cyber-ethnography', 'virtual ethnography', 'network ethnography', 'webnography', and 'digital ethnography'.

(undocumented) experience and degree of conceptual understanding of it, and research questions that emerge during the research process." (Arnould & Wallendorf, 1994, pp. 485-486) Kozintes (2020, p. 6) criticised the general practice of ethnography as "lack of clear direction", "obfuscat[ing]", "frustrating", and "disheartening". [29] Unlike traditional ethnographers who conduct research mainly based on their own understanding and experience, netnographers follow "a detailed, sophisticated, and differentiated set of techniques". (Kozinets, 2020, p. 7) Its specificity differentiates the approach from the general ethnographic inquiry. Kozinets believed that flexibility could be achieved without losing an adequate and in-depth explanation of the methodological reasoning behind the detailed guidance. (2020, p. 6) As "an organised set of research tools", netnography is refined with rigorous procedures and offers a collection of 25 research operations classified into three distinct categories of data collection, data analysis, and data interpretation. (Kozinets, 2020, p. 7) "[T]here is a particular netnographic praxis for collecting investigative data that specifies simplifying, searching, scouting, selection, and saving operations that is entirely unique to netnography and not found in this form in any other account of online ethnography." (Kozinets, 2002, p. 8) Kozinets used an interesting analogy and encouraged readers to regard the guidelines of netnography as basic recipes: "As you learn to become a better chef, you become freed to experiment with adapting and creating your own recipes. But first, you must be given the recipe for the souffle!" (Kozinets, 2020, p. 7)

5.2.2 Strengths and drawbacks of netnography

This section will discuss the strengths and drawbacks of netnography in relation to this research. It will start with an illustration of the strengths of netnography regarding its exclusive focus on online traces and the set of specific and pragmatic techniques and approaches it offers. The section will explain how these characteristics will help the author immerse in and capture the experiences of Chinese people with EVs in an unobtrusive way, reach a larger scope of audience and data materials, solve data collection problems caused by travel restrictions during

[29] Kozinets (2020, p. 6) criticised the obfuscation and lack of guidelines of general ethnography despite the recognition that flexibility is often celebrated as the strength of ethnography as he quoted Christine Hine (2000, p. 12) that ethnography is strengthened by the lack of recipes for doing it".

the Covid-19 pandemic, conduct rigorous research, and reach trustworthy conclusions. This section will also cover the drawbacks of netnography discussed in the literature, followed by the responses to the criticism by proponents of netnographers and online ethnographic scholars in general.

5.2.2.1 Strengths and benefits

As noted in the earlier section, the investigation of online traces with specific techniques and pragmatic approaches makes netnography a "specific, relevant, actionable, and useful" set of research tools that help improve the quality of the ethnographic research to be "rigorous, detailed, current, and ethical." (Kozinets, 2020, p. 9) The exclusive attention paid to online traces in netnography makes unobtrusive data collection possible. With traditional ethnographic methods, the natural and normal practices of everyday life are affected and interrupted by the researcher's presence. (Rageh et al., 2013, p. 131) People are expected to behave differently when asked to stare at the lens of a camera or speak into a microphone just for the purpose of research. When the online traces, which are publicly accessible to anonymous Internet users, become the source of data, the researcher can achieve the goal of engaging with people unobtrusively. Since the phone is in the hands of people, they can choose freely to make their created content go public to suit their own purposes rather than as a research assignment. Even though content created and shared in a public space may not always reflect how the content creators behave in real life due to various reasons, the fact that they are made without being aware of the existence of this research makes sure that their normal routine is not disturbed, and they are much less inclined to modify their behaviour as they would be in a research interview with or without the physical presence of a researcher. A "natural" research environment is thus created, and "honest" data is expected. In fact, we are already conditioned to observe and interpret each other's behaviours through online platforms as ordinary web users in such ways that the whole process of observation and data collection is hardly noticeable.

The specificity of netnography provides a clear direction for conducting online ethnography. (Kozinets, 2020, p. 7) The forte of netnography as a pragmatic approach is to "present researchers with a nuts-and-bolts, workbench-level approach to cultural social media research". (Kozinets, 2020, p. 18) As will be illustrated later in the research process section, the specificity and pragmatism of netnography provide detailed guidelines for this human security research in

data collection and analysis, which helps make the conclusions more convincing and trustworthy.

Another practical benefit of collecting data with the netnographic approach during the Covid-19 pandemic, which can be applied to most online ethnographic approaches, is that the physical presence of the researcher is not necessary for the lives of people to be recorded or captured. A traditional ethnographer would have to immerse himself/herself in the research environment by travelling to another part of the world to observe the behavioural patterns of a group of people; whereas digital ethnographers enjoy more of the geographical freedom and the flexibility of travelling through the Internet to find the field site. "[T]he netnographer can join a culture from the comfort of her own home. – compared with ethnographers: long distance journeys, unfamiliar languages, personal sacrifices, and often dangerous political situations abound in traditional anthropological entrée into the culture of a distant land". (Kozinets, 1998, p. 368)

Apart from the absence of requirement of the researcher's presence, the flexibility of using existing online traces as a data source also refers to the increase in the geographic and demographic radius of the data source. With the reduced logistical and financial burden of netnographic research, the scope of research can be expanded thanks to the rich material offered by online traces covering a wider range of people from more geographically varied locations. Due to the travel restrictions at the time of working on this PhD project, the ordinary people-created online posts, videos, and discussions provide invaluable data for this research to engage with Chinese people's everyday stories of EVs.

5.2.2.2 Drawbacks and responses

The major criticism received by netnography concerns the credibility of the textual data collected in the digital world. Compared with in-person ethnography, which incorporates the balancing of discourse and observed behaviours, netnography gives primacy to textual discourse as the primary source of data. (Kozinets, 1998, p. 367; Kozinets, 2002, p. 64) The conversations in netnography occur through computer mediation and are generated in written text form. (Kozinets, 2002, p. 64) They restructure communication in such ways as eliminating and replacing physicality and body and allowing "more 'pre-editing' of expressed thoughts and thus more opportunities for strategic self-presentation efforts". (Kozinets, 1998, p. 367)

“Devoid of the kinesthetic clues of body language, netnographers may be blinded in a way that in-person researchers are not.” (Kozinets, 1998, p. 369)

As will be explained later in the section on the research process, this research has taken into consideration the potential bias caused by focusing solely on the textual form of materials and intentionally collecting data mainly from two platforms that provide different types of online traces with one well known for its high-quality text-based content and the other as a video platform. While it can be regarded as a weakness of netnography, the data in textual form in netnography, as defended by Kozinets (1998, p. 367), can also be seen as an advantage over its ethnographic counterparts as it is already “transcribed” and thus may be less subject to the “vagaries of memory'.

Apart from the textual form, the other criticism points towards the informant identity in the digital world based on the question of how ‘authentic” the online world is. The identity issue is faced by online data collection methods in general. The tendency has been to view the new technology as mediation between the virtual space and the real world; thus, authentic humanity is rendered lost. As noted in Kozinets' early writings, the difficulty in discerning the identities (Kozinets, 2002, p. 64) brings concerns of dishonesty and misrepresentation of netnographic data collection (Kozinets, 1998, p. 369):

> A major concern in all research is the honesty of the responses upon which a researcher bases her or his conclusions. In netnographic research, this concern is amplified by the uncertain nature of the interactions and respondents. Virtual communities are composed of people who rarely meet face to face, who are largely (but probably not totally) unaccountable for the information they share, and whose identities may be kept permanently anonymous. Because the virtual self is separate from the physical body, and thus apparently from “material” consequences, it might be assumed that this self-simulation is more likely to engage in self-dissimulation…the extreme immateriality of Internet identity can seem almost intractable.

This criticism is based on the condition that the online world is not considered the real world. Horst & Miller (2012, p. 4) provided a solid response to the concern about the authenticity of the online world “in resolute opposition to all approaches that imply that becoming digital has either rendered us less human, less authentic or more mediated.” Contradicting much of what

has been written about online forms of ethnography, Horst & Miller (2012, pp. 11-12) argued that "people are not one iota more mediated by the rise of digital technologies". "In anthropology there is no such thing as pure human immediacy; interacting face-to-face is just as culturally inflected as digitally mediated communication." (Horst & Miller, 2012, p. 12) Instead, the culture of face-to-face interaction works so effectively that we can barely notice its framed nature. (Goffman, 1959; Goffman, 1975) The illusion that we live in a "nonmediated, noncultural predigital world" is, to some extent, exploded with the introduction of digital technologies, the webcam, for example, which people can stare at and talk to without worrying about anyone being around, as they make people "aware and newly self-conscious about those taken-for-granted frames around direct face-to-face encounters". (Horst & Miller, 2012, p. 12)

The argument of Horst and Miller (2012) resonates with Kozinets (2020, p. 12) that perceived the environment of social media as natural: "for most of the world today, social media is a natural part of their everyday experience. Social media inform them, entertain them, annoy, and delight them alongside, as much as, and often more than, any other form of communication and information." (Kozinets, 2020, p. 12) The extremely high penetration rate of leading social media platforms amongst the Chinese people[30] makes the virtual world their natural world.

Kozinets responded to the possibility of dishonesty and misrepresentation of the informant's identity with the so-called "tradeoff effect": "the same freedom which inspires people to mischievously construct deliberate falsehoods about themselves and their opinions also allows them and others the freedom to express aspects of themselves, their ambitions and inner conflicts that they would otherwise keep deeply hidden." (Kozinets, 1998, p. 369) When communicating behind a screen with a pseudonym, people are more likely to be open, honest, and less self-conscious of what information they divulge.[31] "We are equally human in each of the different and diverse arenas of framed behaviour within which we live. Each may, however, bring out different aspects of our humanity and thereby finesse our appreciation of what being human is" (Horst & Miller, 2012, p. 15). In this sense, Kozinets reminded researchers to be

[30] China has the largest population of Internet users in the world. The latest statistics show that the number of Chinese Internet users reached 1 billion, accounting for one in five of the world's users. (Cao, 2021) The penetration rate of major social platforms in China has exceeded 97%, with more than 1.1 billion monthly active users on WeChat, 800 million QQ users, and nearly 500 million on Weibo. (TMI & BCG, 2020, p. 3)

[31] One example given in Wesch (2007) is that Bnessel1973, a YouTuber who lost his son to sudden infant death syndrome (SIDS) in early 2007, shared his thoughts on YouTube: "It allowed me to be silly. It allowed me to act how I wanted to feel…I was finally given the chance to take about what I have gone through."

conscious that the focus of analysis in netnography is on the "online community's communicative acts rather than the complete set of observed acts of consumers in a particular community". (Kozinets, 2002, p. 65) Referring to G. H. Mead (1938) and Ludwig Wittgenstein (1968), Kozinets argued that the ultimate unit of analysis is the behaviour rather than the person. The posting of computer text can be seen as a communicative act or language game. In this sense, the informant identity "crisis" does not exist anymore since "every aspect of the 'game' (the act, type, and content of the posting, the medium, and so on) is relevant observational data in itself, capable of being trustworthy". (Kozinets, 2002, p. 64)

As noted earlier, netnography provides a particular set of actions for doing research within and about social media. (Kozinets, 2020, p. 14) Netnography has been a constantly developing set of operations adopted by researchers over the years following various procedures. For example, Rageh et al. (2013) followed the five-step strategy adapted from the traditional ethnographic methods (gaining, Entrée, gathering and analysing data, ensuring the trustworthiness of data interpretation; conducting ethical research and member checking) in Kozintes (2002) in studying tourist experience. This research will follow the "roadmap" and a number of "basic recipes" laid out in the most recent edition of Netnography. (Kozinets, 2020, p. 7, p. 9) The following section will illustrate the research process in three steps: choosing sites, data collection, and data analysis.

5.3 Research process

5.3.1 Choosing sites

This research has chosen two Chinese social media platforms - *Zhihu* and *Bilibili* – as the primary data-gathering platforms. Five criteria were laid out by Kozinets (2002, p. 63) when evaluating and choosing data collection sites: "(1) a more focused and research question relevant segment, topic, or group, (2) higher "traffic" of postings, (3) larger numbers of discrete message posters, (4) more detailed or descriptively rich data, and (5) more between-member interactions of the type required by the research question". These guiding principles will help create the "most likely" scenario (Wu & Wall, 2019, p. 1720), where the likelihood of observing people sharing experiences regarding tremendous changes brought by the auto industry transition will be maximised. Studies have shown that social-demographic characteristics, such as gender, age, homeownership, technical competence, and geographical factors, significantly impact people's willingness to purchase EVs and found that highly educated, young, and male urban residents show more interest in EVs. (Hardman et al., 2019; Lavieri et al., 2017; Nielsen & Haustein, 2018) As will be illustrated later, the two platforms chosen for data collection in this research feature users who are more inclined to be EV adopters. A large amount of high-quality EV-related post content and discussions as potential data sources are available on both platforms. They help generate the "most likely" scenario.

Informed by the existing literature, the "most likely" case selection strategy (Wu & Wall, 2019, p. 1716), and guided by the specific netnographic site selection criteria laid out earlier, this research has located two popular Chinese social media platforms *Zhihu* and *Bilibili* as fields for data gathering in order to maximise the likelihood to observe people sharing experiences regarding tremendous changes brought by the auto industry transition. Since this research aims to hear people's voices, it is vital to answer the questions of what social groups this research looks into and how their thoughts and ideas are expressed. This section will introduce the two platforms and their users.

Zhihu

Zhihu can be literally translated into “do you know” in traditional Chinese. Since its launch in 2011, Zhihu has won its reputation and stands out from its competitors thanks to its well-educated user community and high-quality and credible content. It is now China’s largest Question and Answer platform where questions of a wide range of topics, such as education, career development, sports, films, technology, lifestyle, and popular social issues, can be asked, answered, liked, edited, commented on, discussed, and shared by its users’ community. (Dudarenok, 2018) As of January 2019, Zhihu has reached 220 million registered users who have contributed a total of 130 million answers on the platform, which makes it China’s largest information-sharing hub. (Shu, 2019) Often called the Chinese version of Quora, Zhihu provides more in-depth experiences and insights than quick answers. Posts and answers on Zhihu can be over 5000 words and cover incredibly specific questions. (DeGennaro, 2020) People share their own experiences in detailed texts, which are both informative and visually appealing, as images, diagrams, graphics, and links to multimedia are embedded where possible to improve the quality of the content. (DeGennaro, 2020) Other users can also like, share, and comment on the posts. The platform also provides the number of answers received by each question and the likes, shares, and comments each answer receives. This feature shows straightforwardly which question has sparked active discussions and how enthusiastic or concerned people are about one specific topic. Besides the users’ own experiences, Zhihu also encourages professional discussions on technical issues amongst its expert users. (Wan, 2020)

Regarding its user group, Zhihu is very popular amongst well-educated and well-paid people who “read long articles and enjoy serious discussions”. (Graziani, 2018) When it was launched, the platform was only available to a select group of people as registered users through direct invitations and referrals, which ensured at the early stage a certain standard of its users and equipped the platform with a “clean” history of sharing quality content. (Graziani, 2018) Many experts and professionals from various industries were drawn to share high-quality insights. It was after 2013 that Zhihu decided to open up its platform to not only experts but also the general public. Even so, the platform also sees a large number of well-educated users gathering to communicate and socialise. Around 80% of its registered users hold a bachelor’s degree or above, and 20% have overseas education experience. (Graziani, 2018) Regarding the income level, 76% of Zhihu users are considered high-income, with 30% making over 10,000 RMB per month (Wan, 2020) compared with the average salary level of Chinese Internet users, a

majority of whom earn between 2000 to 5000 RMB per month. (Graziani, 2018) The high education and income levels and high consumption power (Wan, 2020) helped cultivate the reputation of Zhihu as one of China's most trusted social media platforms. (Shu, 2019)

Apart from income and education levels, the user base of Zhihu has another two demographic features, which are important for the data collection of this research - the age and geographical distribution of its users. These two elements are argued in recent literature to be overlooked but worth more attention in the transition process. (Huang et al., 2021) Compared with other social apps in China, Zhihu has a more mature user base, as 78.2% of its users are older than 25. (Graziani, 2018) Geographically, 40% of its users are based in Tier 1 and Tier 2 cities[32], such as Beijing, Shanghai, Guangzhou, and Hangzhou. (Graziani, 2018; Wan, 2020) It is also interesting to note that Zhihu has a predominantly male audience, which is rare amongst Chinese social platforms. (Graziani, 2018) In general, Zhihu users, mostly well-educated, with professional knowledge, still young but mature enough to be affluent, are presumably a community relatively more willing to accept this new transportation trend. Combined with the factors noted above, as well as the profile of Zhihu as more professional and credible compared to its competitors, the platform provides the target population and credible information for this research, especially experiences and opinions about premium EV models thanks to the income level and social status of the community compared with other popular Chinese social media communities.

Bilbili

Bilibili is one of China's largest video platforms popular among young Chinese. As of August 2021, the average number of daily active Bilibili users has reached 67.2 million. (Asia Markets, 2021) It is a YouTube-like site with enhanced social features. (Jia et al., 2017, p. 1477) Like other user-generated content (UGC) sites, users on Bilibili can consume and share videos they are interested in, vote and comment on videos, and subscribe to channels (of a series of videos). (Jia et al., 2017, p. 1477) Unlike traditional video viewing sites featuring professionally produced videos, Bilibili is a platform where users are more empowered and take on various roles. They are both video consumers who watch and leave comments on videos and video

[32] The city-tier system is widely used to classify China's 613 cities. It classifies the cities into four tiers mainly based on three factors: GDP, administrative level, and population. In general, the higher the tier, the more developed the city is. For additional information on China's city-tier system, see *South China Morning Post* (2016).

makers and uploaders who upload videos for the consumption of other users. They can be both "ordinary" followers who like and follow others' work and influencers followed by others. Developed from the aesthetics of the Chinese young generation, Bilibili covers the content of a wide range of categories that caters to the characteristic lifestyle of the young generation, such as knowledge and digital technology. (Graziani, 2019) The platform is seeing an unprecedented surge in car-related content, as discussions revolving around the future development of automobiles are attracting more attention from the young generation.

Different from Zhihu that features its well-educated and professional middle-class user group, the content on Bilibili gives a young and vibrant vibe and showcases the creativity of the young Chinese people. Various content available on Bilibili where the gradually shifting interests of young people lie and the decentralised and dynamic social interactions it encourages shed some light on its user demographics. (Graziani, 2019) According to China's Internet statistics report, amongst the 300 million young people in China, one out of every two is a Bilibili user. (Xu, 2020) Most of them are college students and young graduates under the so-called demographic cohort of Generation Z (Gen Z). (Xu, 2020) Gen Z refers to the generation born from the mid-1990s to early 2010s with the widespread emergence of the World Wide Web. (Wood, 2013) As one of China's most influential video-sharing social media sites and the "core habitat" for Chinese young people, Bilibili provides the technological infrastructure for the young people to engage in certain forms of public discussion and offers a significant collective space to nurture Gen Z-ers' creativity and participation. (Yin & Fung, 2017, p. 132)

Gen Z is the first social generation that has grown up with access to the Internet, social networks, and mobile systems from their earliest youth. (Francis & Hoefel, 2018) The subjectivity of self-expression, participation, and empowerment of young people, which are essential in their identity development and frequently discussed elements in the broad understanding of human security, are cultivated in everyday life thanks to the online environment. (Yin & Fung, 2017, p. 132) As the first generation of Internet natives, "they [Chinese Gen Z-ers] are an extremely tech-savvy crowd, willing to share their feelings and experiences in forms of online reviews, blog posts and other means of self-expression." (Xu, 2019) Social media works as an "identity college" for young people to explore their hybrid identities and shape their "social self". (Chen, 2020, p. 319) Research suggests that Chinese Gen Z is more likely to make their social media public compared with their Western counterparts who prefer to limit their social media audience to people they know in real life, which indicates that information sharing is more

likely to extend further beyond their intimate circles amongst the Chinese young people. (Xu, 2019)

As the emerging purchasing force in China, the young generation's understanding and attitudes towards EVs constitute an essential part of the puzzle of EVs' social impacts. According to a study jointly conducted by China Automobile Dealers Association (CADA) and J. D. Power, the post-90s (the generation cohort born between 1990 and 1999) surpassed the post-85s (the generation cohort born between 1985 and 1989) in 2020 and became the biggest consumer group in China's auto market, accounting for over 30% of the total car purchase. (Zhang, 2020) The transformation towards younger consumers has become an unavoidable topic in the automotive industry. (Bilibili, 2021, p. 5) The user demography of Bilibili is highly overlapped with that of now mainstream car buyers. According to a survey conducted on Bilibili users, 86% of Gen Z-ers intend to purchase a vehicle, amongst which 37% plan to do it within two years. (Bilibili, 2021, p. 14) Even for that 14% who have no intention at this stage, the two major barriers are financial concerns and the lack of ownership of a driving license, both of which can be overcome in the near future. (Bilibili, 2021, p. 14) This means even those with no intention to adopt a vehicle now will not be stopped from paying attention to and collecting information about vehicles for future purposes. The young generation is the "potential stocks" about to enter society. As they progress into adulthood, their purchasing power will gradually be released. (Bilibili, 2021, p. 14) The analysis of the Chinese young generation is needed to complete the quest for the human security implications of the new mobility trend. In addition to the increasingly pivotal role they play in China's automobile market development, Gen Z-ers have their unique mentalities, beliefs, and attitudes towards the world they live in, partly due to the impacts of the better-quality education they receive and the Internet that is an indispensable part of their everyday lives. (Kim et al., 2020)

Generation cohort, an important factor that has been given much less attention than socioeconomic, political, and cultural factors in security studies, provides researchers with a tool to trace how the trajectory of views and attitudes towards the same issue might differ across generations. It also, more importantly, provides a way to understand the security needs of different generations. (Dimock, 2019) "As global connectivity soars, generational shifts could come to play a more important role in setting behaviour than socioeconomic differences do." (Francis & Hoefel, 2018) It provides alternative insights into the mobility concerns and expectations facing people of different ages. Users on Zhihu and Bilibili demonstrate different

interests and concerns, hold different life expectations, and thus have different mobility-related needs.

5.3.2 Data collection

A netnography in the form of participant observation has been used in this research. It is the primary method for data collection adopted by netnographers. (Morais, 2020, p. 441) As explained by Kozinets: (2002, p. 65)

> "[n]etnography" uses information that is not given specifically, and in confidence, to the marketing researcher. The consumers who originally created the data do not necessarily intend or welcome its use in research representations. Netnographers are professional "lurkers": the uniquely unobtrusive nature of the method is the source of much of its attractiveness and its contentiousness.

This research has followed the guidelines of observational netnography in Kozinets (2020) where investigative data operations are the only type of data collection. (Kozinets, 2020, p. 194) This research collects data by loosely following the structured observational approach of the five-step investigative data collection operations - *simplifying, searching, scouting, selecting, and saving*. (Kozinets, 2020)

5.3.2.1 Simplifying

Simplifying operates to "translate research questions and focus into a consistent set of research terms or keywords". (Kozinets, 2020, p. 212) This step helps identify the key terms of data searching. Guided by the research questions of this research and the specific focus on people's real-life experiences with EVs, this research confirmed "EVs" and "user experience of EVs" as the "searchable search terms" (Kozinets, 2020, p. 217) at the initial simplification stage of investigative data collection.

5.3.2.2 Searching

Searching refers to the act of the entry of keywords, search terms, hashtags, trends, and their variations into research functions and engines. (Kozinets, 2020, p. 218) As noted in the previous section, two platforms were located as fields relevant for data gathering at this stage. In this case, the searching stage of this research involved using the internal search engines of the two platforms to search for pages, threads, posts, videos, comments, and discussions that deal with the research topic based on the key terms identified at the simplifying phase. The iterative feature of the operations means it may lead to searching on the internal search engine for other emerging topics relevant to the research. Guided by the 4As framework and the ontological security approach, the author refined and revised the list of key searching words by adding new and more effective terms to the list, such as “Tesla user experience”, winter using experience of EVs”, and “EV charging experience”.

5.3.2.3 Scouting

Scouting is about “discovery”, “exploration”, and “learning”. (Kozinets, 2020, p. 224) It is the stage for researchers to read through, inspect, and scrutinise the search results in order to seek a deeper cultural understanding. (Kozinets, 2020, p. 224) Meanwhile, scouting is also a process of filtering and selecting viable data to answer the research questions. The author took the step of scouting in the investigation by reading through the research results and following the hot discussion topics around EV use on the two social platforms. This operation provided a chance for the author to get inspired by the discussion, which led to the revealing of more messages and discussions on specific aspects of the topic from the life experiences of ordinary Chinese people that were not included in the initial thoughts when planning the data collection. For example, the discussion on EVs' protective characteristics in extreme weather conditions resulted from this process. The author clearly recorded the location of the content that she found relevant to the research question, made screenshots of textual online traces, including posts, comments, likes, and video clips, and generally outlined the content in the immersion journal for reference. Meanwhile, the learning process of reading the posts and online discussions also led the author to other data sites, such as official websites of car brands, government web portals, and news outlets, for further exploration. Guided by the analytical framework of this research, the author also recorded her impressions and thoughts that occurred in the scouting process regarding the research puzzle of human security and Chinese people's EV use.

5.2.3.4 Selecting

Selecting is the judgement process where specific criteria are applied by researchers to decide what data to include in the research. Selecting helps limit the amount of data in the dataset "to maintain a balance between a thorough and expansive look at a particular phenomenon, and the ability of researchers to go into sufficient depth with a particular amount of data." (Kozinets, 2020, p. 226) The process helps "save their most intense analytical efforts for the primarily informational and on-topic messages". (Kozinets, 2002, p. 64) Based on the scouting process, the author performed additional selection operations upon the data by applying criteria in filtering the results. Koiznets (2020, p. 226) sets guidelines for selecting operations: "relevance, activity, interactivity, diversity and richness."

Relevance

Relevance is the "single more important of the selection criteria". (Kozinets, 2020, p. 227) It means the information collected meaningfully bears upon or is connected with the research. (Kozinets, 2020, p. 227) It is the most obvious criterion guiding the scouting operation in deciding what to explore, how deep to delve into, and whether to record or not. As noted earlier, the author conducted scouting activities carefully with the relevance criterion kept in mind.

A*ctivity*

Activity concerns the "recency and regularity of the flow of information on the social media data site." (Kozinets, 2020, p. 228) This criterion refers to how active and popular the site is for collecting data on a specific topic. This is of particular relevance in this research on EV, which is a rather recent phenomenon. After spending a week on the two platforms following the key search terms identified at the simplifying stage, the author gained a sense that both platforms are popular and active in sharing EV user experiences and discussions about EV-related topics in a broader sense among the Chinses public. All posts selected in the dataset are posts in recent years and have attracted hot discussions. The author also noticed that the latest EV-related information and newsworthy events attract attention and are traced by the users of the two platforms. This proved the recency and regularity of the data sites and made the data gathering on these two platforms more convincing.

Interactivity

Netnograogy is “interested in people’s dynamic social media conversations”. (Kozinets, 2020, p. 228) In addition to the distribution of the broadest possible car-related content, many real-life interactions and social behaviours are documented on the two platforms in various affordances, such as the comment feature. Apart from posts and videos that provide important information to inform the research, the comment section and replies on the post content “tend to be of greater interest”. (Kozinets, 2020, p. 228) They provide a significant resource and great potential for social science research to study an extensive array of human behaviours and interactions. (Legewie & Nassauer, 2018; Jewitt, 2012) “The dataset should be multi-dimensional and contains not only the content information but also the user information including their relationships and interactions.” (Jia et al., 2017, p. 1477) The comment section is ideal for capturing communications and interactions amongst EV users, potential buyers, haters, and those standing in the middle. It serves as a potentially interesting data source to mine implicit knowledge about users' sentiments, ideas, and interests through online discussions. (Hussain et al., 2018, p. 25) Zhihu and Bilibili are equipped with various features for users to engage with the content, such as liking or disliking a post, commenting on it, replying to a comment, and liking or disliking a comment. Ideas and opinions shared in the comment section are valuable data sources that extract insights into people's reactions to specific EV-related matters addressed in the post. In this case, those posts and videos that have attracted heated discussion are the data collection targets in this research. As will be shown later in the data analysis, people do not merely care about how the vehicle serves their own needs. Their concerns and discussion go beyond and cover issues of the development of the EV industry on social and national levels, such as the environmental impacts of the new development, are also included in their consideration and discussion. The participatory culture of online platforms empowered by new information technology and digital media has cultivated a rich environment for online interaction and information flow. The “grass-root creativity and collective intelligence” (Yin & Fung, 2017, p. 134) expressed in the discussions provides valuable data for a comprehensive understanding of the people's perspectives on EV development and its impacts on human security.

Diversity

"Diversity reflects the need for the data site to contain the expression of different types of perspectives." (Kozinets, 2020, p. 228) To achieve a better reflection of the "sort of multi-perspectival and public type of opinion" that this research seeks (p. 229), the author has intended to include a diverse set of voices and viewpoints, especially those that tend to be ignored on these two platforms such as people living in rural areas and young mums. Meanwhile, other popular social platforms that capture the latest news and social discussions about EVs, such as Weibo, have also been targets for data collection to enhance diversity. The inclusive approach to collecting data helps improve the objectivity and comprehensiveness of this research as more voices are heard and more opinions regarding EV-related issues are incorporated.

Richness

Richness relates to "the presence of detail, description, emotion, and interconnection" in the data. (Kozinets, 2020, p. 229) Compared with short textual statements and short tweets that "are usually not rich or deep", rich data, or deep data, reveals human cultural realities:

> Detailed stories and descriptions are some of the best kinds of rich data. Because it is descriptive, anecdotal, and often well crafted, rich data contains a lot of contexts – links to particular social, cultural, and physical environments and identities. These contexts reveal connections the researcher can explore further during analysis and interpretation. (Kozinets, 2020, p. 229)

Information on social websites comes in different forms. People's voices are thus heard in different forms. The two platforms chosen in this research feature traditional textual data and video-based data respectively, which help enhance the data richness. Zhihu is well-known for its high-quality text-based content. An advantage of collecting data on text-based social media in general is argued to be the time and space displacement entailed by asynchronous online communication. (Salmons, 2017, p. 183) Reflective pauses between messages and responses in asynchronous communications bring deeper considerations. (LaBanca, 2011) People are given more time and space to think about the question before sharing their ideas, as there is no pressure to give instant answers like facing the researcher in person. Zhihu provides in-time

information for people to consume; at the same time, it features detailed and comprehensive content partly thanks to the synchronisation or extra time/space given during the communication.

Kozinets (2020) regards data in the forms of photographs and videos as "rare and important", as they "are expressed in a more evocative and eloquent way than is usual." (p. 229) Bilibili is a video-based platform. Amongst all types of data resources offered by social media, videos provide "a fine-grained multimodal record of an event detailing gaze, expression, body posture, and gesture" (Jewitt, 2012, p. 2). Since the launch of the online video platform YouTube in early 2005, video sharing has become a cultural phenomenon embedded in our social activities and encounters. (Hussain et al., 2018) The visual data is "inextricably interwoven with the expression of our personal identities, narratives, lifestyles, cultures and societies, as well as with definitions of time, space, reality and truth". (Pink, 2021, p. 2) Along with the "ever-expanding pool of visual data" (i.e., moving and still images) produced by the fast-developing digital technologies, as well as easy-to-use computer applications for visual editing (Legewie & Nassauer, 2018; Jewitt, 2012), the simultaneous advent of User-Generated Content (UGC) websites, the social media category to which Bilibili belongs, has made the visual data, both professional and casual, more accessible for both the mass public and social science researchers. (Legewie & Nassauer, 2018) In automobile research, the "usually unspoken and not necessarily visible elements of car-based mobility" can be captured and investigated. (Pink, 2019, p. 88)

Apart from the primary video material generated only for the purpose of research by researchers or participants, the use of existing videos as data is increasingly common. (Jewitt, 2012, p. 3) Compared with the traditional visual ethnography of collecting and recording "naturally occurring" data using video cameras by the researcher, which is by now the most established use of video for data collection within the social sciences, (Jewitt, 2012, p. 4) or accessing video data through third parties, such as the police or the court, studies of video data material collected from social platforms, which is a valuable but underexplored field for data collection, can be more time-and cost-efficient, and reaching out to an even larger population with diverse backgrounds from a wide range of locations and an ever-growing amount of exciting and inspiring content revolving everyday life. (Legewie & Nassauer, 2018) A large number of EV-related videos on Bilibili are those shared by uploaders as real EV users. This type of video can go very popular and trigger hot discussions amongst the Bilibili users interested in cars, which helps enhance the richness of the data collected.

5.2.3.5 Saving

Saving refers to using data-saving options such as capture, cut and paste, and scraping to save the data collected. Among the four data-saving options in Kozinets (2020), the author prioritised two operations: Copy and Paste and Screenshots. The author made direct copies of online traces from the two platforms identified as relevant to the research questions into a Microsoft Word document. The author took screenshots and then moved them to a profile on the author's computer. As will be noted later, the data collection and analysis processes were conducted simultaneously. Around 30 posts on Zhihu and 20 videos on Bilibili in total as well as the comment section of these posts were traced by the author between January 2021 and June 2022 until the author believed that the messages conveyed by the data collected were sufficient and rich enough for an interpretation with considerable analytical depth and insight so that valuable conclusions could be drawn from them. (Kozinets, 2002, p.64)

5.3.3 Data analysis

The data analysis of this research was conducted loosely following such analysis operations as data collating, coding, and combining introduced in Kozinets (2020) with a combination of deductive and inductive reasoning to provide organised and evidentially informed description and interpretation of the EV stories told by Chinese people and answer the questions posed by this human security inquiry. Data collation constitutes the preparation stage for coding. The author filtered through the data and removed downloaded data that would not be used in the analysis. She then categorised and formatted the data to prepare it to be coded. At this stage, she transcribed the video clips to be included in the data analysis, aiming to ensure that all data was in one of the three formats: text, photos, or screenshots. Then all data collected from both platforms were filed together in one folder.

The data analysis started early while data collection was still going on, which, according to Miles and Huberman, (1994, p. 50) helps the researcher "cycle back and forth between thinking about the existing data and generating strategies for collecting new, often better, data" to fill in the new gaps or test new hypotheses emerging during the analysis. The understanding of the

parameters of the 4As framework developed at the theoretical framework building stage guided the author in identifying and testing data content related to each parameter in the dataset in a deductive manner. As informed by Miles and Huberman (1994, p. 58), a "start list of codes" could be constructed based on a "conceptual framework, list of research questions, hypotheses, problem areas, and/or key variables that the researcher brings to the study". The initial coding was guided by the analytical framework discussed in Chapter 4. Online traces collected were evaluated for their fit with each parameter. One example is the exploration of the perceptions of the environmental benefits of EVs amongst the Chinese people and if the adoption of EVs makes them feel more secure from environmental degradation. This research delved deep into this topic informed by the conceptualisation of the acceptability parameter as environmental acceptability widely acknowledged in the existing literature.

While relevant themes to the parameters of the 4As framework were identified, coding was constantly refined as new sub-themes kept emerging from the data, reshaping the initial understanding of each parameter derived from the literature. This was the stage where induction reasoning was included in identifying increasingly salient codes that were not included in the start list, through which the author developed her own interpretation of each parameter in a more comprehensive way. For example, the phenomenon that EVs becoming the solution for many in China to maintain mobility due to harsh policies on traditional vehicles becoming part of the story told under the category of accessibility was a result of pure observation and inductive analysis rather than informed by the existing literature. Another example is the discussion of safety in the acceptability chapter.

A similar logic was applied in understanding and evaluating the ontological security part. The author started the analysis guided by the prior themes and indicators that have been proved in the existing literature to have profound influences on people's experiences of ontological security as illustrated in Chapter 4. However, inductive reasoning played a more significant role in identifying the unique patterns telling the unique stories of Chinese people with EVs from the ontological security perspective. To avoid "the danger [of] getting overloaded with more data than can be processed" during the data collection and analysis (Kozinets, 1994, p. 56), the author conducted periodic rereading of the coded notes and stopped collecting new data when the codes became salient, and regularities were demonstrated in the analysis.

The combining operation allowed the author to go through the process of "breaking apart and putting together…smashing and merging…fusing and blending, chopping, and dividing" in order to unite the codes and come up with the new element called "pattern code". (Kozinets, 2020, p. 343) These pattern codes, or the second cycle codes, allowed the author to construct more abstract ideas from the data collected, laid the foundation of the stories told within each parameter in the empirical chapters, and helped answer the research questions in the discussion chapter.

Since the dataset is relatively small and comprised of a variety of forms (text, photos, and screenshots), adding to the strong emphasis on the interpretation of this human security inquiry, the author decided to manually deal with the data in order to feel close to the data and not risk "decontexuali[sing] data" by using data analysis software, even though it was more time-consuming. (Kozinets, 2020 pp. 320-322) The author performed the coding and thematic analysis using copy and paste, highlight, comment, search, and other functions available within Microsoft Word.

5.4 Thoughts on research ethics

Netnography takes research ethics seriously. "The potential for netnography to do harm is a real risk." (Kozinets, 2002, p. 65) There has been debate about whether online information should be treated as private or public in social science research. Building his analysis on the idea that online forums dissolve traditional distinctions between public and private places, King (1996) argued that online data collection makes conventional guidelines of anonymity, confidentiality, and informed consent unclear and thus concluded that getting informed consent is the responsibility of researcher as informants might be deluded about the quasi-public nature of online communications. In contrast, a consensus has been reached among scholars who argue that informed consent is implicit in the act of posting a message to a public area. (Sudweeks &Rafaeli, 1995) Given that precautions have been taken such as providing anonymity to informants, this group of scholars approved an ethical policy in which informed consent is not required. (Kozinets, 2002, p. 65)

Both platforms are considered public sites. All data collected on the platforms, including public profiles and posts, are from publicly available areas. Since these platforms do not require registration or log-in to view the content in the sections where data collection was conducted, and all answers, comments, and discussions are searchable using general search engines by the general public, according to the ethics standard set in Netnography (Kozinets, 2020, p. 197), they can be treated as public information with no requirement of informed consent. If the user posts with online pseudonyms, the pseudonym will appear in the research when quoting, as the avatar has given the user a chosen degree of anonymity. Given that the comments are in the public domain, they are not considered sensitive information. Since all data collected in this research do not involve contacting or communicating directly with people, the author's presence, affiliations, and intentions were not disclosed.

5.5 Limitations of research methodology and coping strategies

Despite the strengths and benefits of collecting data on the two social platforms noted above, this research recognises its limitations. The conclusions of a "netnography" must reflect the limitations of the online medium and the technique. This section will discuss the limitations of the research methodology from three perspectives: the scope of this research, the contextualisation of the research within the Chinese political and cultural conditions, and the bias caused by the author's own experiences.

Scope of the research

The first limitation speaks to the scope of this research in terms of the specific categories of people incorporated in the discussion. This human security research aims to explore how people's essential mobility and other related needs are met in the context of EV development. It is not about EVs per se, but if and how the mobility needs of different people are met with the adoption of EVs. It is reasonable to argue that people's mobility-related needs vary significantly. The differences can be explained from various perspectives as indicated by the four parameters of the As framework (availability, affordability, accessibility, and

acceptability). People would, therefore, show various attitudes towards EVs. In this case, it is impossible to treat the population as a whole. Following the "most likely" case selection strategy (Wu & Wall, 2019, p. 1716), this research has come to its conclusions based on the experiences and thoughts shared by certain groups of people, that is, the Internet-connected population in China, which is more affluent, young, urban, and more importantly, showing more interest in and more likely to adopt EVs than the rest of the population.

Each social media site offers specific communication features and thus attracts a different group of users. For example, the user base of Zhihu has its unique features (relatively well-educated, well-paid, industry professionals, and slightly male-dominated). It can be an ideal group of people to focus on in data collection. However, the group's unique characteristics may make the result of the data collection limited and biased, as they cannot represent the majority of Internet users in China. The messages conveyed by the data cannot represent the voices of all people online. Meanwhile, despite China's high Internet penetration rate, the data collected is biased in that not everyone chooses to speak out their opinions online. People who post publicly on social media may be "more extreme, opinionated, attention-seeking, and self-promotional than those who do not". (Kozinets, 2020, p. 204) Chinese public on social media does not speak for all Chinese public.

These limitations have been taken into consideration in the data collection and analysis. This research has collected data from various platforms and resources to get a mixed voice of Chinese people in order to lessen the impacts of the limitations on the research result. The choice of themes to analyse is based on online observation. That is, this research followed what has been discussed the most. Questions and posts that have received the most likes, shares, and comments, appeared on multiple platforms, and have sparked heated discussions are the focus of the data collection. To lessen the biasing effect of this limitation, this research deliberately collected data on several social media platforms that focus on different groups of people. Despite the recognition that it is impossible to cover all human security implications of the automobility transformation on each individual in China, the author argues that the human security approach provides the possibility for this research to focus on the individual level and explore the perceptions, expectations, and concerns of those who are most likely to be impacted by the newest mobility trend.

Contextualisation of the research

The complex cultural and social communication environment online reviews are embedded in deserves attention. (Kozintes, 2016) It is necessary to take into consideration the bias caused by the research context. Since this research is conducted online, it is essential to consider Chinese Internet surveillance and censorship practices. The Chinese government practices security governmentality in everyday online censorship and surveillance/dataveillance of word flows on the Chinese Internet. (Vuori & Paltemaa, 2015) Research has shown that Chinese censorship efforts are made in such areas as those associated with the ruling Chinese Communist Party as "the post-totalitarian party-state protects its political hardcore against dangerous circulation by trying to prevent public discourse on its leaders and key opponents from going viral". (Vuori & Paltemaa, 2015) In this sense, the data collected in this research has been the result of layers of filtering by the government, which can be a source of bias.

Apart from the unique Chinese political context, another characteristic of the Chinese online environment is the commercialisation embedded in online communities. "If we favour collecting information from message posters who do not maximise their privacy setting but instead share their data publicly, we must realise that these people have particular motivations for sharing their data publicly that may not represent those who choose to keep their data private." (Kozinets, 2020, p. 204) People use online public settings to build an audience for various reasons, some of which are financial. (Kozinets, 2020, p. 204) "The increasingly intertwined or embedded nature of commercial logic and social relationships" constitutes an inherent challenge associated with data collection within online communities. (Kozinets, 2010, p. 83) Even though it is nearly impossible to track the motivations behind every post regarding whether the poster acts as a product promotion agency or only out of altruism or reciprocity, this research has only incorporated those with no explicit product endorsement and marketplace relationships involved in the dataset.

Bias caused by the author's personal experiences

Apart from limitations caused by accessing data, this research also recognises the bias caused by the author herself. "[n]o one goes into a data site without some expectations, assumptions, or filters." (Kozinets, 2020, pp. 318-319) As an introvert who knows the world by observing, the author collected the data mainly based on her observation instead of communication with research participants. In order to reach the least biased observation result, she followed the algorithm of the platforms as an ordinary netizen interested in EVs. In this way, she exposed herself as an ordinary platform user to the EV-related information available to ordinary Chinese people while being "invisible" to other users as she did not involve in any online interaction. Meanwhile, as someone with no driving experience who gave up the idea of driving entirely after her first driving lesson on the road, the author can be biased with such ideas as driving puts her safety at risk. Despite the limitations and bias noticed above, this research still has the potential to convey the real-life messages of Chinese EV users and provide an alternative perspective to exploring the story behind specific perceptions, thoughts, and behaviours of a specific group of users.

Conclusion

With an aim to capture the real experiences and stories of the Chinese people who are living through the daily changes of automobile transformation, this research has collected data on two popular Chinese social media platforms. Social media represents self-empowerment and enabling, which echoes the aim of this human security research to engage with the real-life experiences of ordinary Chinese people. Netnography provides a particular set of actions for doing research within and about social media. Following the "roadmap" and "basic recipes" laid out in the most recent edition of Netnography, this chapter has illustrated the research process and some other considerations including research ethics, methodological limitations, and some coping strategies. Based on the non-intrusive data collected on Chinese social platforms, the following four empirical chapters will tell the stories of Chinese people with EVs.

Chapter 6 Availability

Introduction

The following four empirical chapters will reinterpret the four parameters of the As framework respectively in the exploration of the human security implications of China's EV development. Drawing on the key indicators identified in the ontological security approach (protection, autonomy, and social acceptance), these four chapters aim to draw a comprehensive picture of the implications, focusing on engaging with the real experiences, emotions, and thoughts of ordinary Chinese people.

This chapter will address issues around availability. Along with changes in how the car is powered come changes in the services it can provide for people in achieving their needs. Amongst the four parameters addressed in this research, availability looks into changes to the car's functionality, namely automobility services available for people to use to meet their essential mobility needs, in the automobile industry transformation. It is necessary to clarify, as will be illustrated later in the analysis, availability addresses the automobility itself rather than its access, which is also a pivotal consideration of this research and will be discussed in the affordability and accessibility chapters.

As noted in the previous chapter, cars ontologically secure and empower people with utilitarian and affective-symbolic features. The functionality changes, both empowering and disempowering, coming with technological development experienced by ordinary Chinese people raise real human security implications that should not be ignored. This chapter on availability will explore how these automobile functionality changes affect people meeting their mobility needs on a daily basis.

Before delving into these changes, section 6.1 will define availability in the context of human mobility security. Section 6.2 will proceed with changes brought by the electrification process by bringing into the picture an accompanying process of the transition- intellectualisation. The intellectualisation process will be introduced for a thorough understanding of the whole

automobility transformation. The first two sections will pave the way for the analysis in section 6.3 in terms of how the characteristics of the services provided by cars have been changing due to the automobile transformation.

This chapter will draw on the ontological security approach to achieve a coherent and thoroughgoing understanding of the human security implications of these changes. The complex relationship between automobility practices and their human security implications can be understood through the lens of ontological security. The indicators offered by the ontological security approach, i.e., protection, autonomy, and social acceptance, will help capture the dis/empowering implications of these changes. Described as a "marginalised dimension" within the human security literature (Shani, 2017, p. 277), ontological security provides an ideal analytical framework for exploring the changing availability of automobility and its human security implications.

6.1 Defining availability in human mobility security

In Penchansky and Thomas's healthcare research, availability reflects the relationship between the volume and type of the existing healthcare services and resources and clients' volume and type of needs. (Penchansky & Thomas, 1981) Applying this logic to the human mobility security analysis within the EV context, this research understands availability as indicating the relationship between the existing amount and types of services provided by EVs and people's mobility needs. This relationship echoes the emphasis given to the availability of fuel reserves (oil, natural gas, coal, and renewable energy sources) for primary energy demand from the perspective of national energy security in the APERC research. (APERC, 2007, P. 6) Availability concerns the acquirement of necessary energy resources to support the proper functioning of the state. A diversified energy demand portfolio indicates an even distribution of primary energy sources of a state's energy mix and, thus, a lower risk of energy supply security. (APERC, 2007, p. 44) Translating diversification from the context of national energy supply to that of individual mobility security, the analysis of availability can be achieved from the perspective of the variety of mobility services available to meet people's various needs.

It is necessary to clarify the distinction between the availability of automobility in this context and its access, which will be discussed in later chapters: whereas availability deals with the functionality of the car in meeting people's security needs, its access looks into facilitating factors and barriers shaping people's access to the available EV services, including financial factors that will be covered in the affordability chapter and other factors such as access to charging facilities that will be addressed in the accessibility chapter. As noted in Chapter 3, cars enable, empower, and enrich people's daily lives by offering the user protection, autonomy, and social acceptance. This chapter on availability will examine how these empowering factors will be impacted by the changes in the car itself, such as the equipped EV batteries that make the car more temperature sensitive than traditional ones.

It is also necessary to clarify that availability does not equal car model availability. The development of EVs features the replacement of oil as the power source with arguably cleaner electricity[33]. Along with changes in how the car is powered come changes in the services it provides for people in achieving their needs. Even though the transportation industry has seen a series of encouraging policies introduced and rapid technology advances, the available EV models are still limited compared to traditional internal combustion engine vehicles (ICEV). People are facing limited choices in meeting their particular mobility needs. However, one cannot simply equate the limited EV models available (compared with traditional cars) with the limited services EVs provide to people. The focus of this chapter is thus not on the number of available EV models, which can be explored in a quantitative manner, but the services EVs provide in (dis)empowering people compared with traditional automobiles, and more importantly, how people perceive these changes.

From a consumer's perspective, the successful new energy technology in an energy transition enables the same service with superior or additional characteristics, such as more manageable, cleaner, or more flexible use. (Fouquet, 2016, p. 7) These upgraded characteristics may, in turn, alter the value, even the nature of the service. Drawing on the ontological security analytical tool, the exploration of availability within the human mobility security narrative will look at the transformative characteristics brought by EVs, the following changes in meeting people's

[33] As will be discussed in detail later in the environmental acceptability section in Chapter 7, the environmental implications of China's EV development are complicated and have to be discussed separately regarding its impact on fighting climate change and alleviating local air pollution. One primary reason is that China, at this stage, still relies on burning coal to generate electricity.

rational and symbolic-affective needs compared with traditional ICEVs and, more importantly, their human security implications.

6. 2 Changing definition of the car – electrification and intellectualisation

The development of EVs, changing definitions of cars and their human security implications are demonstrated in different forms where new technology has a more significant role. The ongoing electrification of the automotive industry is considered the primary trend in the future development of China's mobility sector. (Lin & Wu, 2018, p. 233) However, it is by no means the final destination. Instead, electrifying how cars are powered is a necessary step towards a greater mobility transformation: the intellectualisation of the automotive industry and automotive services that follow suit. The development of *intelligent connected vehicles (ICV)* is happening along with, or considered part of, the electrification process. This section will briefly explain what ICV is and, more importantly, why it will be incorporated into this human security analysis. The reasons will be given from two perspectives: one is related to the close connection between the electrification process and the intellectualisation process, which are happening simultaneously as the two sides of the same coin and implications of which can thus hardly be examined separately; the other is the security implications of the new technology breakthrough on both state and individual levels, which will provide more evidence for the analysis of security on both levels in this research.

ICV was officially defined in the *Draft Strategy for Innovation and Development of ICV (智能汽车创新发展战略（征求意见稿）)* by the National Development and Reform Commission (NDRC) in 2018 as

a generation of partially or fully autonomous vehicles that are equipped with advanced sensors, controllers, actuators, and other advanced devices, as well as a series of the latest technologies, such as information telecommunication, the Internet, big data, cloud computing, and artificial intelligence. It is the future generation of automobiles whose function will be transformed from pure transportation to an intelligent mobile space. (通过先进传感器、控制器、执行器等装

置，运用信息通讯、互联网、大数据、云计算、人工智能等新技术，具有部分或完全自动驾驶功能，由单纯交通运输工具逐步向智能移动空间转变的新一代汽车).

This new generation of vehicles will be able to "achieve the exchange and sharing of information between vehicles and other factors, such as individuals, vehicles, roads and the cloud; allow awareness of complex surroundings as well as intelligent decision making; realise safe, efficient, comfortable energy-saving driving"; and may carry out driving operations independently of human beings. (Schlobach & Retzer, 2018, p. 3)

Both the electrification and intellectualisation processes of the auto industry development will be covered in the analysis of this research. It is necessary, thereby, to give a simple explanation of the relationship between the two and why this research will treat the two processes as the two sides of the same coin. A new energy source (electricity) and an intelligent operating system are the two features of the next generation of automobiles. Electrification is the foundation and precondition for developing an intelligent operating system. The lead-acid battery of a traditional car cannot support the proper functioning of the intelligent system because of its high energy consumption needs. Increased electricity input, thus the electrification of the automobile becomes necessary. At the same time, the intelligent operating system helps resolve some functional defects of EVs in the market and relieve concerns from individual travellers about managing the driving range and charging activities. (Chen et al., 2016, p. 245) In this sense, these two processes happen simultaneously, contribute to the automobility transformation, and cannot be analysed separately.

The development of ICV has security implications on both state and individual levels, which is another reason why the intellectual process has been incorporated into this human security research. As noted in chapter 2, new energy-related technological competition is now a major consideration in China's strategic thinking. The final version of *the Strategy for Innovation and Development of ICV (智能汽车创新发展战略， hereinafter "the strategy")* released by NDRC in 2020 identified the development of ICV as the inevitable trend of the global automotive industry, and China is no exception. (Schaub, 2020) Beyond mere electrification

per se, the Strategy reaffirmed the government's goal of becoming the world's leading ICV nation and shaping the industry's standard.[34] (*NDRC*, 2020, p. 4)

In terms of individual security, the *strategy* has made clear that the highly ambitious and exciting development of smart EVs is in line with China's holistic national security view that prioritises the security of Chinese citizens. It has included "serving people's ever-increasing demand for a better life (满足人民日益增长的美好生活需要)" and "improvement of people's sense of well-being (增进人民福祉)" as major goals for the development of smart EVs. (NDRC, 2020, pp. 4-5) This coincides with the notion of human security in empowering people with more possibilities and welfare. As noted in the definition of ICV, functions and the use of motor vehicles are undergoing profound changes, transforming from a simple transport tool to an innovative mobile space. It can be a mobile office or a mobile home for both work and entertainment. (NDRC, 2018, p. 2) EVs are increasingly treated as electronic rather than mechanical products. This will accelerate the development of new life models and potentially change people's lives fundamentally. The intellectualisation process may create new dimensions of the role of the transportation service in meeting people's needs, increasing their well-being, and helping them reach their full potential. It may also bring unprecedented challenges. Both opportunities and challenges bear human security implications that necessitate some attention.

6.3 Human security implications – availability

From the perspective of availability, the implications of car electrification and intellectualisation on human security are about changes in functionality brought by cars and their influences in both utilitarian and affective-symbolic forms. In order to better examine the security implications of the changes in functionality, the analysis of availability will be

[34] To make it happen, *the Strategy* set forth a strategic vision as to how the Chinese government will boost the development of smart vehicles step by step over the next thirty years. (*The Strategy*, p. 5) It shows both the upcoming disruption in many related areas, especially the key pillar of the automotive industry and the government's determination of not "shying away from the disruption". (Schaub, 2020) Efforts also include the recognition of the importance of new stakeholders in the automobile industry as links between IT firms (e.g., Alibaba, Baidu, Tencent) and state-owned automakers (e.g., FAW, Dongfeng) are promoted by the government to drive cross-sector synergies and innovation to achieve its goal of becoming the dominating global market for intelligent and interconnected vehicles. (Trencher et al., 2021, p. 16)

conducted based on the key indicators of ontological security identified earlier, namely protection, autonomy and social acceptance. “Cars may provide enhanced ontological security to those who have access to them, and this may be partly why car owners appear to be so attached to their cars.” (Hiscock et al., 2002, p. 121) The indicators offered by the ontological security approach will help capture both utilitarian and psychological dimensions of the dis/empowering implications of these changes. It may well contribute to understanding subjectivity emphasised within the broad human security approach.

6. 3. 1 Protection – steel skin and shivering heart

As noted in the earlier chapter, cars as comfortable cocoons provide protection in both utilitarian and psychological terms, which underpins one’s ontological security. In the illustration of the human-car relationship, Dawson (2017, p. 7) depicted the automobile as an “extraordinarily disciplined” “driving body” that equips the human being of “the fragile, soft and vulnerable human skin” with “a new steel skin”. Feeling protected is a significant dimension of feeling secure. As a comfortable and private cocoon, cars protect people from undesirable weather conditions and other security risks such as privacy invasion and attacks from strangers.

Home is one of the most frequently discussed spaces for human activities in ontological analysis. (Kearns et al., 2000; Hiscock et al., 2001; Dupuis & Thorns, 1998) Identified as one of the key elements providing ontological security, home is claimed by Saunders (1990, p. 361) to be “[w]here people feel in control of the environment, free from surveillance, free to be themselves and at ease, in the deepest psychological sense, in a world that might at times be experienced as threatening and uncontrollable”. The idea that homes act as a protecting cocoon bracketing out undesirables has been captured in the new generation of car design. The idea of transforming the car from a simple transport tool to an innovative mobile home has been embraced and employed by Chinese EV makers in the next-generation car design. Li Auto, a promising innovator in China’s new energy vehicle market, updated its mission from providing the ideal car and home to “creating homes on the move that bring happiness to the entire family (创造移动的家，创造幸福的家) “. (Li Auto, 2021) “Home” becomes the keyword for the development ideology of the startup, as it enlarges its target family customer group to cover

every family willing to have its "home". Likewise, in the launch video of NIO's concept autonomous electric car NIO EVE, the young girl narrator described the car as "just like home. It is just like my living room." Instead of touching on any technical details or performance, the video showcases how the new car provides a new home "with magic": the young girls' parents can sit together in the car talking to friends from thousands of miles away, while she can enjoy the comfortable seat, which is so soft that almost feels like a cloud. The car has been depicted as a protector like homes are to people: "I can feel safe and cosy …while I sleep, my car would watch out for people on the street". (NIO, 2017) This transformation may still sound far from reality, as key technologies, such as self-driving technologies, have not been fully developed to apply to all roads and cities. However, some people have already experienced the "new capabilities" of ICVs as the car transforms from a sofa on wheels to an intelligent living space on wheels.

Along with the vision of building new homes within the car to provide people with more protection come other changes to the protecting characteristics of cars due to the electrification and intellectualisation processes. More considerations about changes in cars' protection features will be discussed in the following chapters. The data collected amongst the public discussions of EVs in China indicate that considerable attention regarding the availability parameter has been given to the less satisfying protecting capability of EVs during cold weather. Automobiles are often depicted in fascinating car ads as four-wheeling amongst sequoias and across deserts, presenting a haven of safety that protects the driver from blizzards and lightning storms. (Alexander, 2003, p. 550) In contrast, walking to bus stops and waiting for buses and trains are seen as exposing people to rain and snow. (Hiscock et al., 2002, p. 125) The dedicated "new steel skin" provides more protection against different weather conditions compared to public transport.

EVs, however, can be less of a protector compared with traditional cars in frigid weather at this stage of battery technology development. EVs have made no significant change to the "steel skin" as it can be hard to tell the difference from the appearance of the car (even though in China it is made much easier as EVs are given a distinctive number plate with a bright green colour compared with the blue number plates of their traditional counterparts). The temperature-sensitive nature of lithium-ion batteries that power EVs means they are less active in cold weather conditions. There is also an additional need for heating the battery and the diver's cabin in low temperatures. Compared with gasoline cars, whose engine provides

enough heating as the source of their air-conditioning system, EVs obtain the energy required for heating from their batteries. Operating EVs at low temperatures thus increases the power demand. Whether the EV can act as a protective cocoon for people travelling in cold weather, such as the snowy scene in the Jeep commercial noted in Figure 4.1, is thereby called into question. Two direct consequences of the temperature sensitivity of EV batteries are the reduced, and unreliable in some cases, driving range and prolonged charging time. It is thus reasonable to say that EVs, unlike homes sheltering people from extreme weather, are as fearful of winters as the drivers are.

Cold-weather performance remains a significant concern for EV shoppers. (Mao et al., 2021; Zhu et al., 2019) An American Automobile Association (AAA) study reveals that icy temperatures can cut the range by around 41%. (Edmonds, 2019) An earlier on-road test on Chevrolet Volt likewise showed a similar decrease to 47.5% of the range in low temperatures. (Loiselle-Lapointe et al., 2015) This concern is demonstrated in China's EV uptake. It is interesting and important to notice that apart from Beijing, most of the cities where EVs are most well-accepted locate in the southern part of China, where warm winters are expected. As shown in Fig 6.1, apart from Beijing, the other three top provinces with the largest EV stock (Shanghai, Guangdong, and Zhejiang) are in southern China. A decisive reason[35] that prevents people from adopting EVs is the low temperature in the northern part of China during the winter, which has caused the disparity in the EV stock province by province. The temperature can reach as low as -30℃ every winter in the northeast of China, and it lasts for three to four months, which renders EVs unusable in these areas for at least one quarter a year.

[35] Another reason is related to economic development and the urbanisation process. (Li et al., 2019, p. 719) All top EV provinces are developed coastal provinces with more urban households and higher per capita GDP. (Li et al., 2019, p. 718)

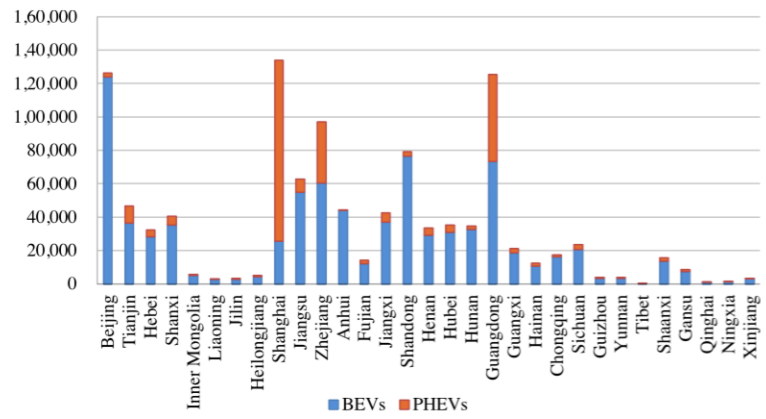

Fig. 6.1 EV stock by province in 2017

Source: Li et al., 2019.

The result echoes the remarks of Chinese EV users, as their stories tell their struggles. Zhihu user 逸杯二锅头's post proved this point. As an EV user based in Beijing in north China, his experience tells the psychological struggles as a parent of using EVs in cold winters. Since the driving range of his Tesla is cut in half during the winter, he experiences the frustration of choosing between offering his child a warm driving environment by turning on the air conditioning and letting him/her suffer in coldness to save the range:

> Now we have entered the winter, we adults can endure [the cold weather], but I have to turn on the air conditioning no matter what when the kid is onboard…When the temperature is low and the air conditioning is turned on, the cruising range of Tesla is simply too miserable. (现在进入冬天了，大人平时开车还能忍一忍，但接送孩子怎么也得开空调…… 天一冷，再加上开空调，特斯拉的续航简直太惨了。)

His experience proves that his electrified car is not well equipped to provide the warm protective space expected from a fossil fuel-burning car. The concerns and psychological struggles coming along with the lack of capability of the car to provide the necessary protection to its users in cold winters lead to the insecure feelings people would not normally expect with traditional cars.

Chinese EV users even shared extreme cases when the car, which is supposed to safeguard the people onboard to their destination against the extreme weather conditions, cannot even start. After leaving his car in a -10 °C environment for three days with an indicated 105 kilometres

of range left, 赵辽了 was devastated to realise that his Chery eQ EV was unable to start. He recorded his devastation in a video and uploaded it to Bilibili:

> As you can see, now I can't start my car and it won't move. I just wanted to go get something from a few miles away… but it was simply dead. (大家看到了，现在我的车打不着走不了。我本来是要去附近拿点东西，其实不远，就几公里的路程 ……但这辆车就是启动不了。)

The protective cocoon, and the sense of security coming with it, provided by cars does not exist anymore in 赵辽了's experience. 逸杯二锅头 and 赵辽了 are not alone. When typing "EV winter performance (电动车冬季表现)" as keywords on the two social platforms, it is easy to find numerous similar remarks shared by EV users who advise people living in the north not to get EVs.

Adding to the discounted battery performance and driving range is the correspondingly limited charging speed. The diminishing range caused by low temperatures in northern China means the number of EV users waiting at charging stations doubles. The increased charging time means even more people will wait in a queue to get charged in the cold weather. Apart from psychological struggles, the "popularity" of charging stations also means physical torture and ill health. For 逸杯二锅头， the physical torture of prolonged charging time can be even worse than the discounted driving range as he worries that he could catch a cold simply by waiting for his car to get charged in the cold weather:

> Now it makes me shiver to go get my car recharged. Beijing is just below zero. I have [already] had my thickest down jacket and big cotton boots on. What should I do in December and January [when the temperature gets even lower]? Is it necessary to buy a thicker set of winter equipment? (现在让我去充电我都哆嗦， 北京刚到零下，我都把最厚的羽绒服、大棉鞋全翻出来，这要是到了 12 月、1 月可咋办？是不是还得去买一套更厚的冬季装备？)

Concerned about the range reduction, some users turn off the air conditioning, which is a main source of EV power consumption in winter, even in the coldest winter. The result is, as shown

in many complaints on social platforms, that many users need to have their thick jackets and even gloves and winter hats on when driving during the winter to avoid catching a cold. There was an interesting survey conducted by auto.sina.com.cn (2020) amongst EV users in north China on Weibo, asking if they have their air conditioning on when driving in winter and the temperature they set. The result shows that 198 of the 746 participants do not have the air conditioning on. There are increasing discussions on EV users suffering from the low temperature on social media, especially during winter 2020/2021, when China experienced a freezing period across both northern and southern regions with record-breaking low temperatures in many places. (Zheng et al., 2021)

The poor performance of EVs in low temperatures in terms of battery capacity loss, shrinking driving ranges, and longer charging time has rendered EVs untrusted amongst EV users as the sensitivity of EV batteries to temperatures has made EVs less of a protector in cold weather. As noted in the earlier chapter, the "protective cocoon", which can be provided by cars, is necessary for an ontologically secure individual to get on with the affairs of day-to-day life and flourish. The protecting features of cars as the buffer between the driver and the outside world shielding people from undesirable weather conditions and providing a sense of security have been discounted due to the automobile transition. It is worth noting that all data collected in this part of the research is from the most recent remarks shared by EV users within the past two years. EV battery technology has seen rapid development over the past decade. However, as shown in the data collected, EVs still cannot effectively protect people in low temperatures like traditional ICEVs, which has caused insecurities amongst users in both utilitarian and psychological terms.

6. 3. 2 Autonomy – enslave or empower?

Autonomy examines the immediacy, frequency and less complexity afforded by car travelling that empower people with a feeling of control and free will. Autonomy provided by traditional cars is demonstrated in the temporal and spatial dimensions of human mobility. They confer freedom to people to go wherever and whenever they desire. This freedom is highlighted in the human security narrative as essential for achieving full human potential. Compared with public transport such as buses that do not always turn up when they are supposed to, cars are considered more reliable. The reliability of cars also gives people a sense of security and control

over their life. This section will explore how people have been enslaved and empowered by the changes brought about by the functionality changes of cars.

6.3.2.1 Enslaving

The empowerment feature of cars and the trustworthy feeling people hold towards them are challenged by the development of EVs, not least due to range anxiety. This section will demonstrate that EVs still cannot compete with traditional cars in empowering people with the autonomy people expect of car travelling at this stage of development. As a result, they are now mainly "the second choice". Private car travelling frees people by offering the choice of travelling to a larger variety of destinations within a reasonable amount of time. The powerful engine of automobiles translates the mechanical power of cars to the users' sense of autonomy living in the world. In contrast, the EV batteries now become a symbol of the car's weakness.[36] Due to the inherent battery capacity issues and complicated charging difficulties that will be discussed in detail in the accessibility chapter, EVs are seen as less than a car at this stage of development. The inherent defects of EV batteries compared with traditional motor engines have rendered EVs a second choice. This perception of EVs held by ordinary people strongly damages the sense of autonomy people gain from car-based mobility. From a human security perspective, the empowering feature of traditional cars is less evident with EVs. The everyday experiences shared by online EV users have proven it.

Many EV users whose remarks have been collected in this research made it clear that the EV is not their first or only car at home, even though the reason for purchasing can be very different. This is not to say that EVs cannot be adopted as the first car. The fact that many choose it as a complementary vehicle shows the limitations of EVs in meeting people's mobility needs. [37] As

[36] Like the lithium-ion battery degradation of smartphones, the capacity of EV batteries also deteriorates over time. It means recharging is needed more frequently, and an EV will travel less far on a single charge. Cold weather will fasten the degradation process. According to the user manuals of XPeng G3, Nio and Tesla, long-time exposure (8 hours or 24 hours) of the EV to -30 °C will cause irreversible damage to the power battery. More instructions on battery maintenance and details of user manuals can be found at https://www.xiaopeng.com/instruction_book/765?type=page (XPeng); http://5491145.s21d-5.faiusrd.com/61/ABUIABA9GAAghZzH_gUoudydnAM.pdf (Tesla, p. 110); https://www.nio.cn/cdn-static/www/user-instructions/ES8UserIstruction-202101260BL290.pdf (Nio, p. 291)

[37] There are conflicting opinions about this argument. Wang et al. (2018) showed that consumers in Shanghai are willing to purchase an EV as a second car rather than replace their ICEVs. In contrast, Chu et al. (2019, p. 12)

W 先生, a NIO ES8 user, said, with an advertised range of 355 km, the actual range was between 260km to 280km based on his own experience. Therefore, whenever he has to drive long distances of more than 200km, he would have no choice but to change to his oil-burning car.

> Owning this car does require a lot in terms of the actual situation of the owner. Basically, you cannot frequently travel long distances. You would better have your own private changer. So, this car is indeed not suitable as the first and the only car in the family. But if the conditions mentioned above are met, having it as a second car in the family is no problem. (买这个车对车主的实际情况确实要求有点高，基本是出长途远门的频率不高，家里最好要有自己的充电桩条件，所以这个车确实不适合作为家庭第一辆且唯一一辆车，但只要满足前面的条件，作为家里第二辆车是完全没问题的。)

As indicated in W 先生's comments, difficulties in recharging constitute another reason for the range anxiety experienced by EV users. These difficulties are demonstrated in two ways: access to charging facilities and the extended charging time. Access to charging facilities will be a major topic in the accessibility chapter. This section will look into the impacts of EVs' extended battery charging time on people's experiences, their expression of autonomy, and, more importantly, how people's sense of security and control will be influenced when using EVs. It is expected that people tend to compare a new product with what they have been used to. In this case, most conventional vehicles only need a trip to a petrol station to refuel every 300 miles. In contrast, EVs need at least 30 minutes for 80% battery capacity on fast charging, which only gives about 50 miles of driving range. (Zhang et al., 2021, p. 186) Zhihu user 望着满天繁星, an EV user of 6 years, complained about the deprivation of freedom she felt with the long charging time. According to her, spending an hour at a fast-charging station does not sound that unbearable. However, there is simply one more fixed weekly chore haunting the EV users that must be done on time. It can be a burdensome feeling and experience that compromises the users' freedom.

compared Chinese and Korean EV owners regarding their car use behaviours and satisfaction levels and concluded that Chinese early adopters have a greater tendency to purchase an EV as their first car.

The observation made in this research echoes the findings of some public reports. According to the New Energy Vehicle consumer market research report (新能源汽车消费市场研究报告) released at the 2019 New Energy Vehicle Consumption Forum, 80% of the consumers who refuse to choose EVs are mainly concerned about the existing range anxiety issue. The travel range has a massive impact on the vehicle's daily use, which is the vehicle's primary function to meet people's basic mobility needs. People who need to travel long distances still prefer not to choose EVs or only as complementary vehicles for short-distance commutes.

This burdensome driving experience has made some EV users think about a fundamental issue concerning autonomy with car use, that is, who serves whom? Miller (2001) started his edited book *Car Cultures* with a fascinating story of an alien he made up to amuse his daughter on her way to school: the alien examining human beings from a spaceship above London observed that

> the earth is inhabited by strange creatures called cars mainly with four wheels although some are great beasts with twelve wheels and some little creatures with only two. These creatures are served by a host of slaves who walk on legs and spend their whole lives serving them. The slaves constantly ensure that the cars are fed their liquid foods whenever they are thirsty and are cured if they have accidents: but the slaves also help in the reproduction and disposal of cars. The slaves are deposited in boxes set up almost everywhere a car wants to go and are always ready to be taken away as soon as the car makes up its mind to go somewhere else. Cars were never seen to go anywhere without at least one slave. The slaves build and maintain long and complex networks of clear space so that cars have little trouble travelling from place to place. Indeed, the earth's creatures seems constantly pampered by their fawning army of slaves. (Miller, 2001, p. 1)

Miller's story depicting the car as the villain that threatens to take over the planet as we come to serve it more than it serves us is found more convincing in how EVs are depicted by Chinese users. *Electric dad (电动爹)* is becoming a popular nickname for EVs amongst Chinese citizens in describing the relationship between EVs and their owners. It literally means that once you adopt an EV, you become its son and must take care of it like family elders.

One repeatedly mentioned struggle amongst Chinese EV users is the careful travel planning made necessary due to range issues. Car owners must “calculate” the cruising range based on their experience, such as whether the air conditioner is on, the driving speed, and the outdoor temperature. When discussing using EVs in winter, many shared the feeling that they are tired of always planning before using the car. As Zhihu user 左泽, living in Beijing, explained why electric cars are still not an option for him:

> I have travel needs in winter when the temperature is lower than -10°C. I don’t want to calculate the remaining battery life and don’t plan to look for charging piles. I want to drive warmly with the air conditioning on. If you live in the south, you will not understand the psychological burden caused by the ‘snow slide’ of the EV range. (冬天有出去浪的需求，零下十几度，不想计算剩余续航，不打算找充电桩，要开空调暖暖和和的开车。假如你在南方，是不会理解冬天纯电动车续航雪崩造成的心理负担。)

Driving on highways also brings more concerns for EV drivers. Although some EV models currently have a range of six or seven hundred kilometres, the high-speed cruising range can be drastically shortened, and the feeling of running long distances with EVs can be devastating. Zhihu user 大诺诺 shared his opinion:

> I love travelling by car. But I cannot accept making efforts to look for charging stations on the highway or places I'm unfamiliar with, let alone the long waiting time. (我个人比较喜欢自驾出游，对于在服务区或者陌生的地方找充电桩是我无法接受的，更别说还要排队家充电等候时间。)

The feeling of losing control can be a great source of insecurity. Giddens (1991, p. 184) suggests that a critical aspect of ontological security is the world appearing to be a reliable place. Discussions about unreliability, which used to be around public transport and indicate the loss of control experiences by people (Hiscock et al., 2002, p. 129), are now seeing an emergence in EV discussions. Besides reliability, convenience is also treated as a source of autonomy offered by car travel. “Convenience provided respondents with feelings of control over their lives and thus enhanced their autonomy.” (Hiscock et al., 2002, p. 126) The travel

plan made necessary because of the range anxiety issue means if one of the charging facilities is damaged or missed, the driver would likely need to wait for the tow truck. The convenience of car travel is, in this sense, discounted. The freedom offered by cars to travel anytime and anywhere does not stand with EVs, at least at this stage of development.

To sum up, autonomy in this context is about cars providing reliable mobility services to facilitate the day-to-day lives of individuals. The key is that people are in control. EVs, however, tell a different story. 大诺诺 shared the feeling:

> A car should serve our driving needs rather than us supporting and serving it. (车是用来开的，不是买来供着的。)

Similarly, Zhihu user 晶晚打老虎 shared her perceptions of the human-car relationship:

> Automobiles are just transport tools. No existential difference exists between a car and a bicycle in serving people's mobility needs. We should not put the cart before the horse and let humans serve the cars. (买车只是一个代步工具，买个自行车或电动车并没有本质区别， 而不应该本末倒置，人为了车服务。)

The notion that it should be the car that serves people's needs, rather than the other way around, has stopped many people from accepting the acclaimed less burdensome mobility choice. It also reflects that EVs still cannot compete with traditional cars in empowering people with the autonomy people expect of car travelling at this stage of development.

6.3.2.2 Empowering

The current status of EVs as the second choice should not, however, overshadow the multitude of new forms of autonomy unlocked with the introduction of smart EVs. Apart from the mobility services considered the primary function of automobiles, the electrification and intellectualisation of automobiles provide users with access to an intelligent mobile space with multiple functions and unprecedented possibilities. By providing people with access to more possibilities in life, these unimaginable functions that traditional vehicles cannot provide have

the potential to empower people with more autonomy in life to achieve their full potential, which is emphasised in the *freedom of want* pillar of the UNDP human security framework.

This development trend brings new forms of autonomy by fulfilling people's various utilitarian needs and symbolic-affective desires. It is important to emphasise that this part of the analysis focuses on people's experiences, thoughts and opinions from 2018 onwards. The reason is obvious: new functionality and the following forms of autonomy afforded by EVs did not emerge until 2018 in China's case. The latest development of intelligent technologies makes the intellectualisation process possible. These new dimensions of automobiles are especially prominent amongst high-end brands and premium models equipped with advanced software, electronic sensors, Artificial Intelligence, and IT communication technologies. In China's case, most discussions and experiences revolving around the intellectualisation shared by EV users are around Tesla and other domestic premium brands, such as NIO, Li Auto and XPeng. At the same time, it is also important to point out that self-driving technologies have not been fully developed to apply to all roads and cities. However, the Advanced Driver Assistance Systems (ADAS) equipped on many EV models, namely the current partial version of autonomous driving, have brought convenience, enjoyable driving experience and freedom to EV users.

The long-term vision of the smart EVs is to create an intelligent and autonomous mobility space so that people can achieve the freedom of travelling, especially those with difficulties in travelling. As Padmasree Warrior, the former CEO of NIO USA, suggested in the launch of the concept autonomous car NIO EVE in 2017, "the vision of the autonomous car is around people, focus[ing] on making life better". The "power of democratising mobility" was emphasised as the company aims to "provides access to mobility to people with restricted ability to drive around." (DP Cars, 2017) This aim has already been achieved in some instances. When Google was to launch its self-driving car company Waymo, Steve Mahan, a legally blind man, was invited to a drive-by Google's pod-like car with no steering wheel and brake pads on his own in Austin, Texas. (Prigg, 2016) Mahan was the first to be given a ride by Google's autonomous car without an engineer on board. He was purposefully selected by Google to demonstrate that not only is the technology ready to enter the real world, but it will also bring dramatic changes to everyday life. "Going where I need to go in a vehicle without having to make any arrangements with other drivers or a family member or some form of public transportation, uh, it just let me be a whole person again," said Mahan later in an interview. (Davies, 2017) The "new driver" brings Mahan autonomy to move independently and freely.

Even though services like Waymo are far from being extended to cover most areas in the world, and it will still take some time before those vulnerable with special needs like Mahan can access autonomous mobility services, the vision of "giv[ing] people the time back to be whoever they want to be" is partly visible amongst Chinese EV users. The benefits brought by assistant driving features of some latest EV models are already prominent in heavy traffic areas and on highways benefiting able-bodied people with more autonomy. As noted earlier, the conception of the automobile is transforming away from a pure transportation tool. The driving assistant mode helps the car move and stop by itself based on distance from other cars. As 小特叔叔 commented, the driving assistant system enables the car to steer, accelerate and brake automatically within its lane so that it gives a feeling of "buying a car and getting a driver for free（买车送司机）". He said that he has the AutoPilot mode on nearly 80% of the time when he drives on the highway, which helps him reduce driving fatigue.

> It seems that I am not driving my Model 3. Instead, it is taking me home.（仿佛不是我在开这台 Model 3 回家，而是它在送我回家。)

Enhancing the intelligence level of the automobile (the free driver) frees people from the most burdensome part of driving. It empowers them with more possibilities for an enjoyable, relaxing, or even productive travelling experience. Along with the new possibilities of travel autonomy comes concerns that the development will potentially remove the driver's autonomy with traditional cars, as more autonomous vehicles mean less self-driving and thus less autonomy. Previous studies have shown that people uphold different understandings of autonomy in driving. In Hiscock et al. (2002, p. 124), some interviewers tend to be more self-reliant and prefer to drive by themselves, as they believe that they are safer when they are in control and less safe when relying on others driving them, whereas others are happier when the responsibility for safety lay in others' hands. In China's case, there is no strong evidence showing that people are concerned about losing the freedom, or autonomy, to decide how to drive and with what speed. Instead, Zhihu user 暖先生 shared his emotional attachment to his Tesla Model 3, demonstrating a new angel to understand the human-car relationship:

I used to have another car. My feeling towards it was I need it, as I need to travel with a transport tool. But with my Model 3, I can't leave it anymore. I'd love to travel far away together with

it. (以前也有过一辆车，它给我的感觉就是，我需要它， 因为我去远方需要它来代步。而 Model3 给我的感觉就是：我离不开它，因为我喜欢和它一起去远方。)

Apart from the empowering driving experience, the scenario depicted in the automobile development policy that our cars will be our second living room in the near future has become true for some EV users. Experiences and "experiments" shared by the users of the new functionality of EVs show that a car is not perceived as just for mobility purposes anymore. Tesla is not alone in this transformation; some emerging Chinese automakers are joining in the cause of exploring the potential of future cars, such as Nio, XPeng Motors, and Li Auto. Like Tesla, NIO ES8 is also equipped with well-developed over-the-air updates for entertainment and communication features that bring people "game-changing" experiences. The cockpit can be turned into a comfortable private cinema in a few steps. Some EV models even afford seat massage functions where the users can indulge themselves by adjusting the seat, resting their feet on the footrest, and enjoying a favourite movie on the central control screen. Tesla user 国哲茂 is a father who has to take his daughter to training courses during weekends. Waiting for his daughter in the car has become much more joyful.

> When my child is tired from doing her homework at home, I would suggest playing some video games with her to get her relaxed. We can now use the car as a game room and play simulated driving games. It is super cool to be able to use the actual steering wheel and brakes in the game. We always have a good time. (我家小孩在家里做作业说做累了，我提议不如地下车库打游戏放松一下吧，于是我们俩把车子当成游戏厅，玩里面的模拟驾车游戏，真正用上了方向盘和刹车，玩得很开心。) (Fig. 6.2)

User 空旷地带 also shared his relaxing charging experience, as he could access Bilibili, IQIYI, Youku, and other online video platforms on his Tesla. All remarks shared above echo the vision of transforming the nature of an automobile from a pure transportation tool to an intelligent mobile space with multiple functions and unlimited possibilities. These new possibilities, like the assistant driving system, help maximise the potential of car use, which confers people power and freedom to decide and manage their car-based travelling and living. The power to make decisions in their "second living room", where people are supposed to feel protected and

free, brings people autonomy, which fits into the *freedom from want* pillar of the broad human security approach.

Figure 6.2. Source: Zhihu. https://www.zhihu.com/question/63220339/answer/791104688 [Accessed 03/04/2022].

6.3.3 Acceptance – dignity and belonging

Being ontologically secure requires a sense of being socially accepted. Acceptance regards how people are perceived against social norms. Dignity and a sense of belonging make an individual ontologically secure. *Freedom from indignity* is emphasised in the broad human security approach as essential for living a fulfilled life. A sense of belonging also contributes to a coherent identity living in the world. This section will explore from two perspectives - dignity and a sense of belonging, the implications of the EV development on Chinese people. By focusing mainly on psychological factors and examining their impacts on people's sense of security, this section will provide more evidence for the importance of the subjective dimension for reaching a comprehensive understanding of human security.

6.3.3.1 Dignity

Dignity, a pillar in the UNDP human security approach, constitutes an important pillar for an individual to see oneself in a positive way within society. Since its introduction, the car has been depicted as a product that the owner should be proud of. It represents dignity and provides a good impression when meeting others. It is affirmative of one's place and worth in society - a means of self-actualisation. (Hiscock et al., 2002, p. 133)

This property of cars is well captured in the car industry's adoption of the "atmosphere" advertisements, where car companies, relying on indirect and visual appeals to attract customers, create "an association between the product and images of luxury, social status, glamorous lifestyles, or other social ideals". (Schorman, 2010, p. 473) In the early 20th century, before the 1920s more specifically, car advertising emerged to focus on the theme of advanced technology. (D'Costa, 2013) The heavy technical descriptions coming along with the car are meant to impress the consumers with the state-of-art technology they own and present the car as "machines with parts and prices to be proud of." (Laird, 1996, p. 797) The car at this stage, before the wide adoption by the ordinary middle class, was a significant prestige for the customers to show who they were. The heavy tech coming along with car promotion fulfils people's psychological needs to be the most prestigious to enjoy the world's most advanced machine thanks to the great industrial revolution.

With the development of EVs, dignity is finding new ways of expression. Just like previous generations of early adopters, the startup costs of owning an EV, especially the premium models with the latest technology, including the acceptance of their determining flaws at this stage, make the early adopters members of an exclusive club. This exclusivity brings pride, prestige, and dignity. This section will examine how the new technology, exceptional driving experience, and cultural connotations embedded in EVs help users establish positive self-images and gain a sense of social acceptance.

Proud to own the imperfect

As shown in the user remarks discussed above, the development empowers people with more possibilities for car use. However, these fancy empowering functions and services are the result of over a decade of development. Some services becoming popular in the past few years were

unavailable for earlier adopters. Even the term ICV was not made official until 2018. Amongst the shared experiences and comments collected, many users have been delighted with their purchase decision. The reasons for the satisfaction vary. A large majority of users have mentioned some common drawbacks and experienced unsatisfying facets of EVs. Take Tesla as an example. Many issues have been found, such as its wind noise, stiff ride, uncomfortable rear seat, and problematic central control system where drivers are forced to make audio, phone, map, and other orders almost exclusively through a centre-mounted touch screen. (Olsen, 2018) However, for some people, these issues, usually considered when purchasing a car, did not constitute a significant barrier stopping them from purchasing an EV. They show more tolerance for the pitfalls of EVs and accept the flaws willingly.

The symbolic attributes can partly explain the willingness as a channel for identity expression. (Noppers et al., 2016) Technical drawbacks do not necessarily have to be a real drawback to someone who seeks to show their identity as an early adopter willing to accept immature technology. Instead of adoption barriers, instrumental drawbacks typical at the introduction stage can enhance the interest in EVs for some as these drawbacks tell the stories of the adopter. As Noppers et al. (2015, p. 75) explain the phenomenon from the perspective of costly signal effect:

> Evaluations of the symbolic attributes predicted interest in sustainable innovations more strongly when consumers expected the sustainable innovations to have some instrumental drawbacks, which reflects a so-called costly signal effect. Such a costly signal effect can be explained by attribution theory: when using sustainable innovations is somewhat costly because of, for example, instrumental drawbacks, the use of sustainable innovations is more likely to be attributed to the user's identity.

This suggests that instrumental drawbacks can strengthen the evaluation of symbolic attributes. When an electric car is believed to have some drawbacks, it can signal the owner's identity more potently. Some people may be more motivated to express their identity and status by adopting EVs with visible flaws. (Noppers et al., 2015, p. 76) This phenomenon can be captured amongst Chinese EV adopters. Some Zhihu users listed the drawbacks of Tesla with pride. Instead of serving their essential mobility needs, EVs are perceived as a “big toy”, the ownership of which tells the society who they are. “This car is just a big toy. You must treat it

and use it as one, rather than a car. (这车就是个大玩具，一定要用你买了个玩具的心态来玩，不要当它是个车。)" 家徒四壁麦克斯, who is a veteran, head of a security team, racer, and a boxing lover, said. He used a large amount of space to describe the problems of his car in his shared experience. He clarified the problems with Tesla, such as water leak, blank screen errors (does not happen very often), poor interior quality, and lousy noises it makes when driving. He also shared some "致命的缺点(fatal flaws)" of his car common amongst all EVs, such as battery degradation and depreciation in the second-hand market. However, he still encouraged people to own it. "If you don't mind all these flaws, go and buy it asap; this car is amazing. (如果你不介意这些[缺点]，尽快买吧, 这车真香。)" "真香" can be translated into "really delicious" or "smells good". It is a popular Chinese internet slang showing something is much better than expected. The flawed Tesla becomes an effective tool for him to think positively of himself. A clear sense of self-pride, which Giddens (1991, p. 66) believes to be intrinsic to one's capability to construct a coherent life story, can be sensed from his online remarks through his description of how much he enjoys his new toy, a premium EV. 家徒四壁麦克斯 called himself a speed maniac in his comment and enjoyed speed racing with others on the road. The new EV technology makes the exciting acceleration and effortless driving experience possible, pushing him to drive extra miles just for enjoyment. EVs, in this case, become a way of expressing oneself and building a tech-savvy identity, which can be an effective way to gain acceptance in the modern world that features, celebrates and worships technological advancement. The process of building self-pride by driving Tesla contributes to the establishment of a coherent self for 家徒四壁麦克斯， which makes him a more ontologically secure person.

Dignity via high speed

家徒四壁麦克斯's remarks also point to another source of dignity brought by EVs: speed. A defining experience of driving an EV is its smooth and rapid acceleration.[38] To build up speed

[38] The fast acceleration performance makes EVs so popular that they are gradually overtaking their petrol supercar equivalents in popularity. (Kochoolu, 2020) The latest TrackDays.co.uk data shows that some superfast EV models, such as Tesla Model S with an acceleration rate from 0 to 60mph of less than 2 seconds (Ludlow, 2021), are experiencing an inexorable rise, and their bookings are outpacing conventional supercars such as Ferrari's, Lamborghinis, Porsches, and Aston Martins. (Kochoolu, 2020)

in a conventional ICE vehicle, the engine has to wind up, and the transmission has to progress through a series of gears; while for EVs, when the accelerator is pressed, the instant torque of the EV provided by the electric motor delivers immediate power and acceleration to the wheels. (Dodge, 2014) “It felt like a serene bubble, floating aloof of the world below it.” (Stanley, 2019) Power is delivered instantly - much faster than any petrol- or diesel-powered car can do. (Charman, 2019) The outstanding acceleration performance of EVs has been enjoyed by many Chinese EV adopters and has become a way to show superiority on the road. Tesla user 国哲茂 described his acceleration experience as smooth as cutting butter with a heated knife. The feeling of superiority experienced on his way to work boosts his confidence and stays with him in life.

6.3.3.2 Sense of belonging

Apart from a positive self-image, which brings dignity and self-pride, a sense of belonging is also created by using a car. With the proliferation of car adoption, some themes apart from the pursuit of speed and technology have been added to the list to meet people’s psychological needs in expressing their identity. The sense of belonging, which also constitutes an important element of being socially accepted, is created amongst a certain group of EV users. In other words, driving is perceived as the socially acceptable thing to do and offers people the proper social role to play. (Kent, 2003, p. 46)

Belonging to the premium community

The acceptance under the ontological security framework can be translated into being “normal” by driving a car against the user of alternative transport as the “other”. (Kent, 2013). Within the EV context, it can also be interpreted as us as a community against them as outsiders. One example is the exclusive user community created by NIO. The company established NIO radio, an exclusive online interactive audio community for its users who can use it to connect and communicate 24/7. The radio covers feature news, finance and weather forecasts, top NIO Community news, music, and life tips shared by NIO users. It is publicised as “a channel from our users’ voice, the exclusive high-quality radio powered by the NIO community”. (NIO, 2021)

As NIO ES8 user Ming, quoted in NIO's official blog, shares his/her experiences of getting his/her voice heard within the NIO community:

> NIO Radio changed my lifestyle. Before getting my new ES8, I used to listen to FM radio channels or my iPod music when I'm in my car, but now I can't stop listening to NIO Radio…My favourite show on NIO Radio is 'You Have Stories,' where you can hear the voices of NIO users just like me. I understand why NIO Radio is so popular because it not just provides the music, but also offers the platform for ordinary people to share their stories.

NIO user Jia also expressed his/her gratitude for being embraced in the NIO community in the same blog:

> I didn't expect that buying a car could bring a whole community to my life, not sure what else I can get for my next car except NIO.

Apart from the radio platform, NIO users also "spend time on the NIO App every day, visit NIO Houses in every city, get charged up at power swap stations, and purchase the uniquely designed NIO Life products." (NIO, 2021) The company also holds annual NIO Day events, which are for not only the launch of latest technology and models but also the gathering of the NIO community. (NIO, 2021) As members of the community that only those who own the premium EV are allowed, NIO users feel proud to earn the membership. The experience of belonging to a premium group brings them a strong sense of being accepted.

Proud Chinese young generation in Guochao

As noted earlier, car adoption may satisfy various psychological needs in expressing individual identity. Apart from a cultural identity of being "modern" and "tech-savvy" or belonging to a premium group, EVs provide new forms of identity. Amongst them, *Guochao* constitutes an excellent example of the influence of EVs on the identity development of the Chinese young generation. Translated into National Tide, *Guochao* is a Chinese trend manifesting Chinese consumers' newly found interest in Chinese cultural heritage, traditions and willingness to purchase domestic brands. (Gaujacq, 2021) For a long time, foreign brands dominated the Chinese consumer market and were usually associated with premium quality or a prestigious

brand image. Nowadays, foreign brands have not been dethroned from their leading position in the Chinese market, and their advantages are still prevailing. However, the tides are now turning. (Gaujacq, 2021) Recent years have seen an increasing enthusiasm for homegrown products, especially amongst the Gen Z cohort (Bala, 2021), who have grown in an ever more prosperous China with strong national pride and cultural confidence. (Gaujacq, 2021) Unlike previous generations, China's Gen Z cohort is notably more enthusiastic about "Made in China" products. (Bala, 2021)

The trend is particularly prevalent in the automobile industry (Liu, 2020), as domestic brands constitute a large majority of EVs sold in China. "Some Chinese car brands, such as BYD, have made tremendous breakthroughs in both technology and marketing. A certain degree of brand stickiness has been formed within the young consumer group." (Liu, 2020) Surveys conducted by Sina and Bilibili demonstrated that the intention of purchasing domestic-brand EVs is at the highest within Gen Z-ers amongst all generation cohorts in China, accounting for more than 30%. The launch of the Benben E-Star National Edition in 2021 constitutes a good example. [Figure 6.3] The domestic brand takes inspiration from "doughnuts" to upgrade and inject high sweetness and bright colours into the young consumer market. Advertised as the choice of "national youth (国民青年) ", this bright-coloured new series is dedicated to Chinese young people whom Guochao strongly influences. The popularity of homemade products amongst the young generation contributes to the fast development of the EV industry in China. At the same time, the embracement of EVs offers young people a chance to express their identity as proud young Chinese. This cultural identity provides them with a feeling of being socially accepted within the Chinese youth community, which can be a source of ontological security necessary for them to achieve full development within the society they are proud to live in.

Figure 6.3 BenBen E-Star National Edition. "Doughnuts" series. Changan Auto. https://www.changan.com.cn/car/benben-E-Star/ [Accessed 19/08/2021].

Conclusion

Availability in the context of human mobility security concerns the functionality of cars in dis/empowering people. This chapter examined the impacts of automobility availability on human security through the lens of the embracing framework of ontological security (protection, autonomy, and social acceptance). Based on the data collected, this chapter explored the human security implications of automobile transformation by looking into new interpretations and expressions of the framework amongst different social groups and in different contexts.

The intellectualisation of the automotive industry, along with the electrification process, creates new dimensions of the role of transportation services in meeting people's needs by empowering them with more freedom and autonomy in reaching their full potential. The futuristic technology, exceptional driving experiences, and embedded cultural connotations contribute to building a positive self-image and a sense of belonging. However, the fancy empowering features cannot overshadow inherent capacity issues with EV batteries at this stage of development. EVs still cannot effectively protect people in low temperatures like traditional ICEVs. The range issues, charging issues, and less stability in certain driving conditions render EVs a complementary option. The burdensome experiences shared by some EV users

demonstrate that EVs still cannot compete with traditional cars in affording people necessary mobility services required from a human security perspective.

The popularity of some affordable domestic EV brands amongst the young Chinese generation, as examined at the end of this chapter, reflects the emphasis given to affordability in China's EV policymaking. As noted in earlier chapters, affordability has been the primary consideration in China's EV policy on the demand side in promoting EV adoption. The next chapter will explore how affordability factors have been understood and employed in China's EV development and how certain groups of people have been empowered to achieve mobility freedom.

Chapter 7 Affordability

Introduction

The previous chapter investigated what functionality changes have been brought by the automobility transformation and how these changes have impacted meeting people's mobility-related needs. It focused on changes in automobiles as both an object and mobility services in meeting people's utilitarian and psychological needs. In other words, the previous chapter concentrated on the changes in the characteristics of automobility itself. The following two chapters, namely affordability and accessibility, will address changes in people's access to automobility along the automobile transformation, with the affordability chapter addressing the financial factors impacting people's access to automobility and the accessibility chapter dealing with other issues concerning access such as EV charging facilities. This chapter will deal with financial considerations, including the financial incentive policies and the introduction of budget EVs, in China's EV policymaking and their implications on people's access to mobility services essential to their daily lives.

As usually the second largest family expenditure after housing (Dawson, 2017, p. 3), car adoption is closely connected to people's economic security, an essential pillar identified in the UNDP human security framework. How financially affordable automobility is constitutes a critical lens through which to understand the human security implications of EV development. This chapter is not a quantitative analysis of the financial costs of owning EVs, which can be achieved with quantitative methods. Instead, it is a qualitative exploration guided by the interests and attention of the Chinese people. Their perceptions of how affordable EVs are constitute the foundation of the arguments made in this chapter. As discussed at the end of the previous chapter, the introduction of domestic brand budget EV models has benefited the Chinese young generation and made automobility more affordable. Compared with the "common sense" of linking EVs with costly premium cars (Hagman et al., 2016, p. 11), the budget car phenomenon says more about EV development specific in China's context. Based on online observation, this chapter will examine if the introduction of EVs has made automobility more affordable, who the beneficiaries are, and accompanying human security

implications, which will shed light on the understanding of China's EV policymaking that has been focusing on affordability.

7.1 Defining affordability

This chapter aims to explore if electrified mobility is perceived as affordable for ordinary Chinese people. And, more importantly, how this perception has influenced people's sense of security. Economic security is identified as one of the seven human security pillars in the UN human security framework. As usually the second largest family expenditure after housing (Dawson, 2017, p. 3), car adoption is also closely connected to people's economic security, another essential human security pillar. Cars have a significant influence on the economic situation of a family. At the same time, as analysed earlier, cars' ubiquity in societies nowadays as both functional tools and a psychological cocoon makes them a form of empowering protection for people to have more autonomy to choose, establish their identity through it, live the life they want, and achieve their full potential. In this sense, how financially affordable automobility is, to some extent, determines how empowering cars can be. Affordability thus constitutes an essential perspective of understanding the human security implications of EV development.

Affordability addresses financial access to automobility. The question here is how financially affordable electrified mobility is for ordinary Chinese people. The common-sense knowledge, or "the general consensus within the industry, press and the public", as proclaimed by some scholars (Hagman et al., 2016, p. 11), seems to be that EVs are significantly more costly than comparable ICE-powered variants, (Knupfer et al., 2017, p. 10) which has been framed by existing research as a negative influence on, even the primary barrier to EV diffusion. (Sharpe & Lenton, 2020) The ownership cost differential between EVs and conventional vehicles has been adopted to explain the differences in the EV adoption level amongst countries. The success of Norway (with an EV market share of over 50% by 2019) has been attributed to the cost parity between EVs and traditional cars: "the progressive tax system makes most EV models cheaper to buy compared to a similar petrol model... This is mainly why the Norwegian EV market is so successful compared to any other country." (Sharpe & Lenton, 2020, pp. 5-6)

This chapter is not a statistical comparison between traditional cars and their electric counterparts, which can be conducted more effectively with quantitative methods. [39] Affordability, instead, is treated as a subjective perception in this research. It is a notion of relativity as the standard of what makes things affordable varies amongst people from different backgrounds. Studies have come to various conclusions concerning if the cost is an essential consideration in people's embracement of the new mobility tool.[40] This research concerns more about perceived costs and affordability than that supported by quantitative data. This chapter will thereby address affordability, which has a substantial impact on the economic security of ordinary people, by looking into what popular financial considerations ordinary Chinese people hold based on online observation and exploring if EVs are perceived as affordable amongst Chinese people.

The exploration of the affordability of electrified mobility, a significant consideration of the Chinese government in promoting EV uptake, contributes to a better understanding of China's EV policymaking. As noted in Chapter 3, by replacing imported oil with more affordable coal to generate electricity to power automobiles, the development of China's EV industry contributes to the country's energy security by enhancing energy affordability. Affordable energy is one of the most important driving forces to transform the automobile industry. The Chinese government has taken into financial considerations in its EV promotion with generous subsidy projects, assuming cost could significantly influence the EV uptake amongst the members of the public, which is believed to have enabled the country to become the world's largest EV market. (Lambert, 2018) Exploring Chinese people's perceptions of affordability will shed light on whether the Chinese EV policy has been effective.

[39] A considerable amount of studies have discussed the total cost of EV ownership and the discrepancy in total cost of ownership (TCO) between EVs and traditional ICEVs. (Thiel et al., 2010; Chu et al., 2019; Wu et al., 2015) They have come to different conclusions on cost parity issues. For example, Chu et al. (2019, p. 3) argue that even with generous government subsidies, the most substantial part of China's EV policymaking on the demand side to promote EV uptake, EVs cannot compete economically with traditional cars in China. While the review conducted by Wu et al. (2015, p. 207) pointed to the difficulty and complexity of comparing the cost efficiency of EVs and traditional cars as it highly depends on annual driving distance, vehicle class, access to relevant data and reasonable assumptions about future conditions, concluding that the assessment can be a real challenge.

[40] A questionnaire survey conducted amongst Chinese urban households' EV purchase intentions covering 30 provinces indicated that under subsidy contexts, cost factors do not significantly influence urban households' purchase intentions in China, compared with such considerations as cruising power and charging facility availability. (Dong et al., 2020) In contrast, a study based on the data collected on a Chinese automobile information website showed that cost considerations are the most important factors affecting consumers' decisions. (Ren et al., 2021, pp. 16-18)

Subsidy policy

Subsidy policy is at the heart of the Chinese government's EV promotion on the demand side. Reaching the cost parity without assistance from tax or subsidy is defined as a "tipping point" of the transformation. (Sharpe & Lenton, 2020, p. 6) As is the case globally, it is difficult for EVs to compete with ICEVs without government subsidies, as the total cost of ownership of EVs remains higher than that of traditional cars. (Chu et al., 2019, pp. 2-3) In China, national and local governments have introduced financial incentive measures on the demand side to support the EV industry development and EV diffusion, i.e., product subsidies, free of purchase tax, etc. High purchase subsidies and tax exemptions have been the highlight of China's EV policymaking. "China has offered consumers large discounts to drive uptake at scale and pace." (Munos, 2021) Research has shown a robust positive effect of EV subsidies on EV diffusion in China, as a 1 per cent increase in total subsidy translates into an 0.5 per cent increase in newly registered EVs. (Kalthaus, & Sun, 2021, p. 494) According to China Automotive Technology and Research Centre (CATARC), purchase subsidies contribute to more than half of China's EV market growth. (Li et al., 2020) Other complementary transport policies, such as service-fee reductions for public charging stations, parking fee discounts, and EV-related tax exemptions, have also significantly supported China's EV market development. (Li et al., 2020; Ying & Shen, 2019) In China's case, the generous EV subsidy policies have imprinted the close connection between EV purchases and subsidies in Chinese people's perception, which helps strengthen the mindset that EVs are affordable.

Widely discussed in the EV literature as one of the most effective EV promotion policies in China[41](Ma et al., 2017; Li et al., 2019; Kalthaus & Sun, 2021, p. 494), direct price reductions and generous purchase subsidies are, however, not sustainable. (Wang et al., 2017b, p. 488) It results in a tremendous financial burden for the government and weakens the technology innovation incentive of carmakers. Chinese automakers are lamented as "too dependent on subsidies". (Wang et al., 2017b, p. 488) China announced it would extend the purchase subsidies until 2022 when it had initially planned to discontinue. (Munos, 2021)[42] There are uncertainties on the way forward as the Chinese government discontinues its subsidy programs.

[41] Alternative opinions exist. For example, Wang et al. (2017a) find no significant effect of purchase subsidies on China's EV diffusion.

[42] According to the latest news, the Chinese government is negotiating with manufacturers to extend costly EV subsidies again to 2023 if necessary to stimulate the market. (Interesse, 2022)

Other measures are necessary to keep the feeling amongst Chinese people that EVs are affordable. In this sense, this chapter will focus on a unique emerging phenomenon of EV uptake in China that has the potential to strengthen the impression amongst the Chinese public that EVs are financially affordable – the introduction of budget micro-EVs.

Explore affordability of electric automobility in China - budget micro-EV phenomenon

This chapter will examine if EVs are financially empowering or disempowering for people to access the mobility services they need. As noted earlier, this chapter focuses on perceptions rather than statistics. The online observation of Chinese people's perceptions allows this research to spot some phenomena specific to China's context. From a qualitative perspective, this chapter will analyse based on a China-specific phenomenon observed online – the popularity of budget EVs. Apart from the premium EVs aimed at the luxury-sedan segment mentioned in the availability chapter that make unimaginable empowering features available, another feature of China's EV development, the welcoming of more affordable EVs aimed at a wider group of the Chinese population, tells another important story.

The simplest reason for choosing budget EVs as a phenomenon to analyse is that they are the best-selling EVs in China given their sales numbers. "[A] contributor to increasing sales was from small, affordable BEVs which are well suited to the Chinese customer base." (Conway et al., 2021, p. 5) This chapter will delve deep into this phenomenon and explore why these models are popular and what security they bring to the people. Their popularity provides a good lens through which to examine the mentality of Chinese people and what they regard as essential and secure. Challenging the common sense that EVs are pricy, this chapter will examine how Chinese people perceive EVs in terms of affordability in their own way. More importantly, by drawing on key ontological security indicators, this chapter will examine the human security implications of EVs from the financial cost perspective.

Apart from the BenBen mentioned in the previous chapter, another EV model, Hong Guang Mini EV, another pocket-sized vehicle developed by General Motors' joint venture with Wuling Motors and Chinese state-owned SAIC Motor, has been dominating the Chinese EV market and outselling all more prominent players in almost every month in China since its debut in July 2020. With a starting price of RMB28,800 (approximately US$4,485 or £3,200),

Hong Guang Mini EV is labelled as “the people’s commuting tool (人民的代步车)” in its advertising. It has become so popular because of its affordable price that expressions like “you can drive it home with the money for three iPhones (3台苹果手机的钱就能把它开回家)” are often seen in online EV discussions. With a 9.2 kilowatt-hour (kWh) battery capacity and a fully charged driving range of 120 km, bare-bones Hong Guang Mini EV cannot compete with premium models in battery, range, and performance. In this case, its becoming a blockbuster tells how affordability can be a significant consideration for Chinese people in accessing mobility services they need.

The following section will explore why budget EVs have become a unique phenomenon in China and, more importantly, how empowering they are from a human security perspective. Hong Guang Mini EV is one of a slew of low-cost EVs. They target less affluent families looking for a real or complementary car at an affordable price. The wide adoption of budget EVs means they meet a wider range of people's mobility needs. Guided by the ontological security approach, the following section will examine who these people are and how their lives have been improved, which will shed light on Chinese people's perception of the affordability of EVs and how people are empowered by the policy.

7.2 Budget micro EVs - people’s empowering tool

The introduction of budget EVs opens car ownership and increased mobility “to a whole class of people who previously could not afford to have their own wheels”. (Davis, 2021) The social effects of this shift can be far-reaching. By bringing down the financial cost, budget EVs solve the financial security struggles of many lower-income families in China concerning car purchasing and make the ontological security-empowering characteristics of cars even more powerful. Based on the collected online data, the following section will examine these characteristics from the experiences and thoughts shared by three specific groups of people, namely young people who just started working, people living in small towns and rural areas, and women, including young mums, who are often the ignored population in car-related discussions. The analysis will be based on the ontological security framework illustrated in the previous chapter.

7.2.1 "Young people's first car (年轻人的第一辆车)"

As indicated by the Benben case, it is not hard to find that young people who are studying or have just started working constitute a significant part of budget EV adopters. The official data shows that 72% of the Hong Guang Mini EV owners are post-90s. (Liu, 2021)[43] Most of them use the budget EV to commute. Not likely to be the group of consumers who can afford premium EVs that are still pricier than their traditional counterparts and frustrated by the heavy traffic in big cities, young people find their mobility need hard to fulfil with an affordable cost. The introduction of budget EVs perfectly solved the problem.

The frustration can be sensed from the data collected. The only reason for Bilibili uploader 香芋蛋筒, a Hong Guang Mini EV user, to purchase the car was because she was too tired of the 1.5-hour daily commute after she moved home:

> I finally had an internal outburst while sitting in the BRT[44] on an extremely congested commute. I must buy a car! (我终于在一次极其拥堵的下班路上坐在 BRT 里内心爆发了。 我一定要买一台车！)

It is interesting to notice that a majority of those who commented on 香芋蛋筒's video are young graduates who call themselves "corporate slave (社畜)", a popular self-mocking expression in the Chinese society for those who are unfairly exploited and underpaid. As companies become increasingly demanding, many employees, especially younger ones at lower levels, are being forced to work overtime and sacrifice their personal lives. It is especially the case in big cities, where fierce competition exists. What makes these "slaves' life" even more bitter is the long commute distance many of them face on a daily basis. Budget EVs like Hong Guang Mini EV solve the mobility needs of the young generation in the most affordable way. The specific mobility needs of the young "corporate slaves" are clear: practical and affordable. Many young graduates who have just started working expressed their willingness to adopt it in the comments of 香芋蛋筒's video. As Bilibili user 我有一套限量的约翰蓝侬

[43] This does not indicate that EVs are generally more popular amongst the young generation than mature customers. In fact, EV consumers tend to be older than consumers who purchase conventional petrol cars in China. (Huang et al., 2021, p. 1)

[44] Bus rapid transit.

纪念邮票 commented and described how much he/she is eager to experience the sense of autonomy offered by the small budget car:

> …I just started working. It takes 40 minutes [to drive to work]. Now I'm still relying on colleagues to give me a ride. I'm also planning to get this tiny car and drive to work with it… (……我刚刚工作，开车大概 40 分钟， 目前还在蹭同事车上班，也打算以后买这个小车车上班……)

Unable to "choose" how the work life is, the simplest "travel freedom" offered by budget EVs gives them much-needed protection essential to their already trembling work-life balance. With a more affordable price, the empowering characteristic of cars in protecting people from undesirable weather conditions can now be enjoyed by more people, including those who have just started working without much savings. As illustrated in the previous chapter, cars gain their appeal as a safe, private space protective against attacks from strangers and the weather. (Hiscock et al., 2002, p. 125) The previous chapter analysed the weather dimension of protection from the perspective of changes in automobility itself, namely the weaker role of EVs in protecting people in extreme weather due to the inherent technical drawbacks of EVs, which may get solved as the technology advances. However, the protection character of cars can be addressed from a different perspective when financial barriers get lower. Even though, as noted in the previous chapter, the protection available is not as powerful as that offered by traditional cars, the target consumer group here has changed to those who could only afford a budget microcar like Hong Guang Mini EV. With a much more affordable price, potential dangers caused by storms can be avoided. As Bilibili user 雪崩崩猪皮盾 described budget EVs compared with electric scooters popular in China:

> When the weather is cold and rainy, you will know how lucky it is to have a roof over your head; it feels like Buddha is holding the umbrella for you. (天冷下雨的时候你就知道有个顶是多幸福， 就好像佛祖在给你挡伞一样。)

原创骆驼 agreed with 雪崩崩猪皮盾 and shared his/her suffering of riding an electric two-wheeler during windy and snowy winter time in north China and expressed his/her strong willingness to purchase one despite his/her short commute distance. The affordability of the

car makes it, as referred to by young graduates like 失足咸鱼, “the first car of young people (年轻人的第一辆车)”.

The feeling of being able to afford a brand-new car boosts young people's dignity and self-acceptance, which are intrinsic to the individual’s capacity to maintain ontological security (Giddens 1991: 66). Bilibili user 婧婧的小眼袋, who just graduated, commented on 香芋蛋筒’s video that the car seems to be “the one that can be afforded by oneself (自己买得起的车)”. Bilibili user 符策， who is still a student and preparing for his/her driving license test, said he/she is planning to get one as he/she can afford it:

> Only RMB 30000, it seems that I can pay in instalments. Mum and dad can help with the down payment. I only need to pay RMB 1000 monthly and never have to squeeze into the subway to work anymore. (才 3 万多， 好像还可以分期付款， 首付爸爸妈妈可以帮我付， 后面每个月好像[才]1000 多， 这样上班就不用挤地铁了。)

The fact that even those who just started to work can now afford to own their brand-new car makes the young people think positively of themselves and acts as a booster to their ontological security.

7.2.2 People in rural areas

Since the initial launching program in 2009, cities have consistently been the frontier for accelerating electrification in China, as cities make specific policies and development plans guided by the central and provincial governments and provide substantial financial support for EV purchases on top of the central government subsidies. (Jin et al., 2021, p. 14) First-tier cities[45] have been leading China’s EV market. (Huang et al., 2021) The top ten cities made up 48 per cent of EV sales in 2020, according to the China Association of Automobile

[45] Tier 1 cities are often considered the megapolises of China.

Manufacturers (CAAM). (Shi, 2021) Currently, most EV adoption surveys target first- and second-tier city residents. (Huang et al., 2021, p.2) The disparity in EV distribution is evident. The potential of EV development in rural areas, where more than 500 million people live but fewer than 1 in 5 have until recently owned a car, can be huge. (Davis, 2021) In fact, research has found through large-scale social experiments that people in small towns are more willing to accept EVs: "consumers from smaller cities are more likely to adopt EVs demonstrate the market potential for EVs in smaller cities, and importantly, cast doubt on current government policies and EV-related infrastructure development in China, which have, so far, been targeted principally to first-tier cities." (Huang et al., 2021, p. 11)

Realising the remaining scope for expanding EV sales beyond the largest and wealthiest cities, the vision of China's EV development now involves driving uptake in small towns and rural areas. This vision has been materialised with the introduction of a new EV policy in China: *new energy vehicles going to the countryside(新能源汽车下乡),* along with China's strategy to unleash the consumption potential of lower-tier cities and rural areas as a new economic growth driver. (Shi, 2021) According to the Ministry of Industry and Information Technology (MIIT), ten automakers will offer varying discounts that are, on average, RMB2,000-5,000 (US$285-715) for a total of 16 new energy vehicle models. (Yu, 2020) Research shows that rural customers are willing to spend no more than RMB50,000 (US$7160) on average on a new car purchase. Most of the electric cars sold during this round of promotional campaigns will be priced below RMB100,000, and heavy subsidies are expected from carmakers. (Yu, 2020) Even though Hong Guang Mini EV is now mostly sold in first- and second-tier cities, it has the massive potential of penetration in small towns and rural markets, where the most Chinese population live, thanks to its affordable price. "Apart from 49 first- and second-tier cities, the rest of China can be all included in this realm, where people earn less money than in big cities and prefer more cost-effective or cheaper products." (Li, 2019) The affordability of the Hong Guang Mini EV will benefit more people and equip those less affluent in lower-tier cities and rural areas who cannot afford a car before with this practical mini car.

Post-95s fruit farmer 果农小震子 living in the rural area of Henan province shared his experience of using budget EV Chery Little Ant on Bilibili. For a young farmer living in a rural area, choices are limited. The most significant limitation is the financial cost. The availability of the mini EV gives people like him much more power to choose. After all, it is relatively harder to find a reliable oil-burning car with a similar price. He did a very detailed cost

calculation and comparison with traditional cars in his video. He concluded that this budget EV saved him more than RMB 6000 (around £ 734) a year, which was a considerable amount for him. Similarly, Zhihu user 一颗草莓 said that with her private charger in the rural area, the budget EV only costs her less than RMB 0.08 (around £ 0.0095) per kilometre. The introduction of budget EVs provides those living in rural areas with a means to own a private car in an economically secure manner.

果农小震子's experience indicates the high level of compatibility of using EVs in rural areas. As will be discussed later in the next chapter, private charging has been a major barrier to EV adoption. Apart from the affordable cost and people's ability to pay for it, the high compatibility of EV use in rural areas means better access to private charging, which has become a major barrier for city dwellers to enjoy the empowering features of EVs. It is well acknowledged that public charging in rural areas remains challenging, as public charging facilities are distributed in proportionate with the number of EV uptake. In other words, they are concentrated in top-tier cities such as Beijing, Shanghai, and Shenzhen. (Yu, 2020) However, the experiences shared by Chinese rural EV users demonstrate that some rural areas are more suitable for EV adoption, as many people there have their courtyard for installing the charging facility. As Zhihu user 一颗草莓 put it, "living in the countryside, you can install the charger wherever you want (农村的想把它[充电桩]安在哪里就安在那里)".

7.2.3 Young mums

As Hong Guang Mini EV rises to fame and becomes a hit amongst the young generation, young females become a unique group of customers. Around 60 per cent of Hong Guang Mini owners are females. While the human security approach has been criticised for being blind to the gender dimensions of security and insecurity (Newman, 2021, p. 6), this is not the case in the context of this research, as Chinese EV manufacturers have taken into consideration the needs of women in their car design and promotion so that their EV models can be more attractive to them. This section will demonstrate that this act of car manufacturers has empowered women to meet their daily mobility needs and brought autonomy and convenience to their lives.

Apart from the intentional promotion targeting females made by the carmaker[46], young mums, another largely ignored community, have been benefiting from the introduction of budget EVs. Budget EVs, as a widespread phenomenon in China's EV adoption, are a popular second car in the family. Women's role in this phenomenon, however, is less discussed. A frequently spotted keyword in online EV discussions is *"magic car for picking up kids and doing grocery shopping (接娃买菜神车)"*. Travelling with children on public transport could be particularly difficult. Cars, instead, are seen as suiting a variety of people and journeys as they are more manageable with children (Hamilton et al., 1991). Amongst the online experiences shared by budget electric microcar users, many of them are mums with young children. Bilibili user 果媽 is one of them. As she said, a microcar like this is perfect as the second car of the family like hers with two children[47].

Affordability for young mums plays an important role. Meanwhile, convenience and safety provided by car travelling are also appreciated amongst them. Many have expressed their frustrations with traffic congestion during peak hours when they pick up their children from school and do grocery shopping. The long traffic means pricy fuel cost. They need a cost-effective microcar to help them move easily on the road during busy hours while saving money. Budget EVs are more convenient than buses and underground trains, safer than bicycles and motorbikes, and more affordable than traditional cars. This explains why some EV models are dedicated to women. The popularity of budget micro EVs amongst women is an understandable trend. They are at this stage accepted to accomplish specific tasks in certain scenarios due to their limitations, such as inner-city commuting, picking up children from school and grocery shopping. Traditionally, these mundane daily activities occupy a more significant amount of time for women than men. It is, therefore, reasonable to assume that, unlike traditional cars, EVs may play a more welcoming part in women's lives. This trend, in turn, has empowered women by gaining more mobility freedom, even though it is partly driven by the limitations of EVs.

There is still a noticeable tendency in online EV discussions to compare budget EVs like Hong Guang Mini EV with more expensive and better-equipped cars, as some criticise budget EVs

[46] Hong Guang Mini EV is constantly debuting new colours, especially ones popular amongst female consumers. For example, its newest series of 'macaroon' colours are avocado green, peach pink, and lemon yellow.

[47] With the abolition of China's one-child policy, the basic Chinese family has been changing from a family of three to those with two or even more children.

for their less satisfying product quality and cruising range. At the same time, there is a clear struggle amongst some people in the face of domestic-made budget EVs due to the strong symbolic meanings of cars: whether to "save face", live in dignity, and never get involved with the "cheap" solution,[48] or to be utilitarian and prioritise everyday needs. Deeply rooted in the Confucian symbolic value system, face consciousness is still taken seriously in China as people are concerned about whether their behaviours will make them gain or lose "face" within their community. Face consciousness constitutes an essential part of living in dignity, regarded as necessary to achieve individual security for Chinese people. Some admittedly acknowledge the importance of their "dignity" and find the brand value important in strengthening their self-pride. As Bilibili user Aliesroo put it, commenting on 果农小震子's video,

> Brand value is very important for me when buying a car. It's my vanity, and I cannot help. (我买车还是挺看重品牌价值的。没办法，就是有点虚荣心。)

The popularity of budget micro EVs indicates, however, that people are gradually accepting the limited capability of EVs in meeting people's mobility needs, as discussed in the availability chapter, and are re-evaluating EVs by exploring how EVs can make their life better despite their drawbacks. With their advantages and disadvantages, EVs have a role to play in meeting people's needs, even though the needs to be met can differ from travelling with traditional cars. Sun et al. (2017) found that EV drivers in Beijing tend to use their EVs for shorter distances. The convenient public intercity transport system in China also means that long-distance driving may not be essential for some people.[49] As 果农小震子 said at the end of his video, the Chery Little Ant he uses is not meant for driving long distances. It would be the driver torturing himself if he does so, indicating that it is the user's responsibility not to choose a budget EV with undesirable driving ranges if he/she has to drive long distances. The

[48] The fact that many models of these domestic budget EVs have been utilised as taxis and for car-sharing businesses has strengthened the impression of these cars as cheap.

[49]There are alternative opinions about the geographic implications for Chinese people's demand for driving range: "In the context of China and in particular when we consider its geographic size, driving range is likely to be a more important consideration for Chinese consumers than for consumers who live in geographically smaller countries. It is also important to note that Chinese urban areas are also very large and car owners must also travel long distances within cities." (Huang et al., 2021, p. 2)

popularity of budget EVs in the Chinese society demonstrates that these affordable cars are playing their role in helping many achieve mobility freedom.

It is necessary to note that, unlike developed western countries, the Chinese population did not have a car as a necessity until recent decades. In this sense, the dignity in the human security narrative brought by owning a private car, even a budget one, can be even stronger in the Chinese society. As argued by Hiscock et al. (2002, p. 130), public transport, the poor services with often unexplained delays and the lack of courtesy of some drivers could imply to passengers that they are not valued members of society. Owning private car by the above-mentioned groups of people who can barely afford them without the introduction of budget EVs acts as a strong booster of self-value.

This dignity can be further understood with the notion of self-nurture. The popularity of budget EVs inspires people to put aside some common concerns with EVs and instead see them as a way of self-nurturing and acceptance. Self-acceptance, as an integral part of being ontologically secure, can be achieved through self-nurture. (Kent, 2016) It is worth reiterating that the comparison is made between budget EVs and other forms of mobility, such as motorcycles, bicycles, and public transport, rather than high-performance automobiles. For young graduates, rural and small-town dwellers who can barely afford automobiles of any kind, and young mums who need a complementary car at home to make their life easier, electric microcars provide more protection, autonomy, and self-pride. For those who have purchased it, limitations in the service provided by budget EVs are no longer shortcomings, as they have already considered them in their car-using scenarios. The decision to drive and enjoy "car-comfort" can be conceptualised as "a deeper dive to nurture oneself". (Kent, 2016, p. 9) The self-nurturing experiences bring the drivers "good" feelings about themselves in subtle ways, which can strengthen their ontological security.

A sense of social belonging can also be obtained. As Dupuy (1999, p. 10) put it, "on obtaining one's driver's license, one benefits from the size of the club made up by those who already possess theirs. On acquiring a car, one benefits from the size of the pre-existing fleet". As a "socially accepted way to be mobile" (Kent, 2013, p. 235), access to automobility, even though

achieved with budget EVs, gives people a feeling of being included and the power to show the world that they are just as good as others (those who can afford a private car).

7.3 Are EVs perceived as affordable?

The idea that EVs are pricy is not as strong as presumed, thanks to the generous financial incentives policies, which have been effective in China's EV promotion in the past decade but are likely to be completely phased out in 2022, (Munos, 2021) and the emergence of budget EVs over the past few years, which, as noted earlier, is gaining momentum and to some extent shaping Chinese people's perception of EVs as affordable to a wider population in meeting their mobility needs and living the life they want. In fact, other factors have also contributed to the formation of this perception. One unique character of China's EV industry is that it is made up of mainly domestic manufacturers due to trade protectionism[50] employed by the Chinese government with an intention to "leapfrog" advanced auto industries worldwide. Traditional Chinese brands such as BYD and their car models tend to be relatively more affordable amongst the Chinese people. For those domestic startups such as NIO and XPeng that produce premium EV models, since they are new players in the automobile industry without experience in producing ICEVs, the cost discrepancy is not obvious amongst the general public. Meanwhile, some popular EV models in China have seen a continuous price drop. One example is Tesla. Since Tesla has achieved domestic production in China, the production cost has tremendously decreased. Along with the maturity of technologies and the mass production of key components, like all electronic products, the public expectation in China is that EV prices will continually decrease. At the same time, lower charging and maintenance cost has also contributed to the affordability of EVs. The government even introduced policies to set a national price ceiling for recharging rates in public and private stations. (Trencher, 2021, p, 10) In this sense, EVs will become increasingly more affordable and have more potential to serve people's mobility needs better. As noted earlier, the effective yet unsustainable EV subsidy policies are gradually being removed. The emerging unique phenomenon of budget EVs in China may provide an alternative solution in making EVs

[50] Trade protectionism is gradually being lifted in recent years, as the government welcomes foreign competitors to boost the healthy development of the domestic market. The establishment of the Tesla Gigafactory in Shanghai is an example.

affordable or at least strengthening the impression amongst the Chinese public that EVs are affordable.

There is, as always, another side of the story. Recently the Chinese EV market has entered a pivotal stage as the first generation of EVs expires. The battery is the defining part of EVs, and the cost of batteries determines both the cost of new EVs and their value on the second-hand market. After five to six years, some adopters struggle with keeping their car as the battery performance gets increasingly unsatisfying. They can either change the battery, which can cost even more than half of the price they paid for the car, or sell it in the second-hand markets, where EVs depreciate much more than traditional vehicles. This example indicates that apart from the upfront cost, there is still more to explore on how affordable EVs are perceived regarding other factors such as EV battery degradation.

It is fair to say that the affordability of EVs made possible by the factors noted above, especially the introduction of budget electric microcars, constitutes a major driving force in China’s EV adoption, which is what China’s EV policymaking aims to achieve. The popularisation of budget EVs demonstrates that a large group of people see affordability as their major concern in meeting their mobility needs. Contrary to people’s typical perceptions that concerns, such as undesirable driving range popular amongst EVs, will stop people from choosing EVs, affordability seems to be an even more significant consideration amongst a massive group of Chinese people. They are willing to sacrifice comfort and performance for function, as cutting-edge technology and fancy features are just the icings on the cake for them. They need an affordable transport tool whose space, power and safety can meet the needs of their daily driving. Fortunately, their needs have been noticed by the Chinese government and accurately located and solved by some EV makers. Contrary to the “common sense”, affordability can hardly be described as a major barrier to EV adoption in China’s context. It provides a wider range of mass public decent mobility services with more affordable costs.

7.4 Affordability as the Chinese approach to the automobile transformation

The popularity of budget EVs indicates both a current reality and a future trend in China's EV development. As noted in Chapter 3, there is a contrast between the outstanding performance of China's EV development as a strategic industry to enhance China's energy security and get ahead in the new era of world energy competition and the less satisfying domestic performance of the industry. The unprecedented popularity of Hong Guang Mini EV signifies a feasible Chinese solution to the stagnated development of EVs. Global and Chinese automobile retail has seen a decline since 2019 and it was also heavily hit by the global pandemic. The EV sale, however, increased. Besides Tesla, budget EVs have been the biggest contributor to sales. Since the first month of its retail deliveries in July 2020 when 15,000 units were sold, it has been the top-selling EV in China. (Davis, 2021) Hong Guang Mini EV is one of several low-cost EVs introduced to the Chinese market. It is reasonable to assume that more similar models will gain more traction, and more people will be able to meet their mobility needs with fewer economic security concerns. Shaun Rein, managing director of the China Market Research Group, told the BBC that "we remain very bullish on the adoption of budget EVs like the Hong Guang Mini to higher-end ones like NIO and Tesla." (Harper, 2021)

Internationally, China's budget EV strategy, and more importantly, Chinese people's acceptance of it, has gained the country more advantages as most EV markets in Europe and the US tend to focus on the upper segments. (Munos, 2020) The goal of strengthening its competitiveness in auto manufacturing is more achievable in the context of a transition to EVs. (Sharpe & Lenton, 2020, p. 6) Even though many models published in the literature thus far predict that price parity can be reached by 2030 between EVs and traditional ICEVs when battery prices fall below $100/kWh, (Knupfer et al., 2017, p. 10) there have been different voices and experts disagree on how much and how fast. (Graham & Brungard, 2021, p. 306; MIT Energy Initiative, 2019, p. 75) The current reality that the adoption of budget EVs in China outstrips higher-end ones like NIO and Tesla is believed to have contributed to the lower EV retail price in China and is believed by experts to be the future trend of China's EV development. (Harper, 2021) The past decade has witnessed the EV average price plummeting in China – a drop of 47% from €41,800 in 2011 to €22,100. (March, 2021) In stark contrast, the average price in Europe has increased by 28% from €33,292 in 2012 to €42,568 in 2021.

(March, 2021) Likewise, a report from UK-based automotive data analysis firm JATO Dynamics shows a significant price gap between EVs in China, Europe and the US. (Munos, 2020) The average EV retail price (excluding any kind of incentive) in Europe and the US in 2019 was 58% and 52% higher than in China, respectively. (Munos, 2020) The report believed that the massive difference in retail prices – namely affordability – partly explains China's higher EV penetration rate. (Munos, 2020) EV prices in the Western market will remain at a premium point[51], which may discourage consumers from making the switch. Without a good understanding of what consumers need, the current EV market in Europe is filled with over-priced city cars that are too expensive for average earners. (Winton, 2021; McDonald, 2019) As the Western OEMs have not come up with innovative ways of making EV prices more affordable (Munos, 2021), modestly priced mini EVs, like Hong Guang Mini EV produced in China, can become more appealing to Western consumers (March, 2021), making it a strong competitor in the global EV market.[52] The budget EV strategy is in line with China's global EV development vision: "China has also been able to grow very quickly due to an emphasis on cheap production. Where the EU decided to push luxury EVs, China has instead focused on affordable models and as a result, found success in higher sales and strong consumer uptake – catalysing the industry to grow at pace." (Munos, 2020)

It is argued that the success of budget EVs in China can be the sign of the beginning for China to influence the world automobile industry by building its global automobile brands. The Chinese government's broader ambition is to " become a global automobile superpower" by creating EVs that can compete with western OEMs. (Munos, 2021) "For the first time, Europeans will have competitive Chinese vehicles, trying to be sold in Europe, at competitive prices with competitive technology." (March, 2021) The affordability of China-produced budget EVs gives Chinese manufacturers a strong foothold in the global automobile transformation. It provides them with the possibility of broad penetration of Chinese EVs in the Western EV market, making China "a threat to the hegemony of Europe's traditional car manufacturers". (March, 2021) Meanwhile, scholars have envisioned the penetration of Chinese budget EVs in such emerging markets as Sub-Saharan African countries, which is

[51] It has been argued that "current European Union regulations greatly favour the profitability of heavier and pricier EV's, leaving almost no room for smaller European cars to make a decent profit". (March, 2021)

[52] At the time of writing this section, Hong Guang Mini EV has already been rebadged as Freze Nikrob and made its appearance in Europe. It is assembled in Lithuania using parts imported from China. (Page, 2021)

believed to be able to light up the African EV scene as young people on the continent will be able to afford to replace their second-hand internal combustion cars usually imported from Europe or Asia with brand new electric ones. (Kuhudzai, 2021)

Conclusion

This chapter discussed the human security implications of the automobile industry transition from the perspective of financial affordability. As usually the second largest family expenditure after housing, car adoption is closely connected to people's economic security, which constitutes an important lens through which to understand the human security implications of EV development. Apart from the widely discussed generous subsidy policies, this chapter highlighted the empowering characteristics of budget EVs, a unique phenomenon of China's EV development. Three groups of people of close relevance to the budget EV phenomenon, namely the young Chinese, people living in rural areas and small towns and young mums, and their shared experiences of using budget EVs have been examined from the perspective of ontological security to prove the point.

In general, it is fair to argue that the "common sense" that EVs are less financially affordable is not as strong as presumed in China's context, thanks to the generous financial incentives policies, the emergence of budget EVs over the past few years, and some other factors such as China's unique domestic brand-dominated EV market. As the effective yet unsustainable EV subsidy policies are gradually being removed, the emerging unique phenomenon of budget EVs in China may provide an alternative solution in shaping Chinese people's perception of EVs as affordable to a wider population in meeting their mobility needs and living a more empowering life.

A contrast has been noted in Chapter 2 between the outstanding performance of China's EV development as a strategic industry to enhance China's energy security and get ahead in the new era of world energy competition and the less satisfying domestic performance of the industry. The introduction of budget EVs can be an effective measure with Chinese characteristics to fill the gap in boosting the domestic market so that a sustainable EV industry

can be developed, which is vital for the industry to serve its strategic purposes. It has become a strategy with strong Chinese characteristics that aims to challenge advanced automobile industries and become a global automobile superpower.

As noted at the beginning, this chapter and the following one address changes in people's access to automobility along the automobile transformation. This chapter discussed financial factors impacting people's access to automobility. As will be shown in the next chapter, where other issues concerning access such as EV charging facilities will be looked at, there are certain limitations of the "full" access to automobility needed by the mass public. The next chapter will complement the affordability perspective by discussing other factors concerning changes in access to automobility along with the electrification process and, together with this chapter, provide a comprehensive view of the access to electrified automobility in China's context.

Chapter 8 Accessibility

Introduction

As noted repeatedly in previous chapters, this research aims to discuss access to electrified automobility, an important piece of this human energy security puzzle, from two perspectives: affordability and accessibility. The previous chapter addressed changes to people's automobility due to car electrification from a financial perspective and how they empower certain groups of Chinese people with mobility freedom and shape the general perception amongst the mass public that adopting EVs is an economically secure thing to do. Built on the financial considerations discussed in the previous chapter, this chapter will proceed further with two access-related issues -restrictive transport policies and the charging infrastructure dilemma, which the online EV discussions in the Chinese society feature. They have attracted considerable public attention and potentially shaped the public perception of how accessible EVs are for people to empower themselves in achieving mobility freedom.

In contrast to the promising picture depicted in the affordability chapter, this chapter will focus on the access barriers, which can be best captured through the experiences of a group of people - Chinese early adopters who have been "forced" to be EV users because of restrictive transport policies. Early adopters of innovative technologies are commonly described as being more comfortable with and showing more trust towards uncertainties, or in other words, being more ontologically secure. (Siegrist,1999; Siegrist, 2003; Edison & Geissler, 2003) This chapter will examine, from an ontological security perspective, how the Chinese early adopters are less secure than typically presumed, which will inform an alternative interpretation of early adopters of innovative technologies with characteristics of strong insecurities.

The experiences shared by Chinese insecure early EV adopters and their attitudes towards access-related topics will tell a good story of major barriers to full access to EVs amongst the Chinese public, which will help complement the affordability chapter in providing a finer-grained picture of EV access amongst the Chinese public and prove with evidence that the threshold to EV access remains high for many. Restrictive transport policies and limitations to

people's access to necessary charging facilities prominent in China’s EV development at this stage render people powerless. This chapter, focusing more on the “negative” aspect of domestic EV development based on the disempowering experiences shared by Chinese users, particularly those insecure early adopters, will provide more evidence of the struggles of Chinese EV users.

8.1 Defining accessibility

People’s access to certain services in meeting basic needs and achieving full potential constitutes an integral part of the UNDP human security pillar of *freedom from want*. The previous chapter noted that financial issues are significant considerations in China’s EV policymaking. Effective measures such as generous purchase subsidies and other financial incentives, along with the introduction and promotion of budget EV models dedicated to meeting the necessary mobility needs of certain groups of people at an affordable cost, are welcomed by the Chinese people and perceived as empowering. The financial element is, however, far from the only determinant influencing ordinary Chinese people's access to EV adoption. Other access-related factors will also shape people's perception of how accessible EVs are. In this sense, this chapter will, under the label of accessibility, investigate changes in people's access to mobility services along with car electrification, how policies have been shaping the changes, and how people are responding.

As noted in Chapter 3, one major energy security consideration in transforming the automobile industry is that domestically produced electricity is more accessible than oil imported from abroad. The accessibility of energy sources is thus largely improved on the national level. Translating this logic with individuals as the referent object, accessibility deals with if and how the electrification of automobiles makes mobility services more accessible for individuals. Financial considerations have been discussed in the previous chapter. Based on the online observation, this research has identified two other notable access-related features of China’s transportation transformation that have caused broad concerns amongst Chinese EV users: restrictive transport policies and the charging infrastructure dilemma. With the introduction of an increasingly stringent suite of ICEV registration and use restrictions by the Chinese government in some cities to constrain the surging number of local private cars, some cities

dwellers have been “forced” to become early adopters as the only way to maintain their basic automobility needs due to the exemption of restrictions enjoyed by EVs. For many of these “unwilling” early adopters, charging freedom has not been achieved. The lack of access to a private charger at home and the charging difficulties they encounter at public charging facilities, which will be discussed in detail later in the next section, lead to a sense of powerlessness amongst them. Combining the impacts of these two factors, this chapter will picture through the eyes of Chinese early adopters the struggles people suffer in the face of the high threshold of EV access and the insecurities it has caused.

8.2 Forced early adopters

This chapter aims to illustrate EV accessibility through the experiences shared by Chinese early EV adopters. As will be examined in detail in the next section, early adopters of innovative technologies are usually described as being more comfortable with and showing more trust towards uncertainties, or in other words, being more ontologically secure. (Edison & Geissler, 2003) Through the lens of human security, this chapter will propose an alternative interpretation of early adopters prominent in China’s EV development context. By arguing that some Chinese early EV adopters in China are not ontologically secure, this chapter will provide evidence for the current access barriers to EVs in China, which may lead to negative public perceptions about how empowering EVs are.

Before making the argument, it is necessary to examine the sources of their insecurities. The shared experiences of early EV adopters in China help identify two major sources of insecurities: the restrictive policy on automobile purchasing and the high threshold of accessing EV charging facilities. This section will examine these two sources discussed extensively by the Chinese people. The discussion will explain what being forced to become an early adopter is like in China’s context. The evidence provided by this section will lay the foundation for the next section, where the argument that forced Chinese early adopters are insecure early adopters will be further discussed.

8.2.1 EVs as the only means of keeping automobility

As noted in the previous chapter, financial access seems to be the major human security consideration in China's EV policymaking on the demand side. In fact, another unique accessibility-related measure has also been applied to encourage EV uptake in China. This measure refers to policy restrictions on traditional cars. Automobile registration restrictions, plate number purchase restrictions, and other car use restrictions have been introduced in some cities to constrain the surge in the number of local private cars. The exemption of restrictions enjoyed by EVs has resulted in the "forced" popularity of EVs. EV adopters are considered either "subsidy-driven" or "fear-driven" since it is the only way for some city dwellers to obtain immediate car licensing without paying a lot extra.[53]

As mentioned earlier, China has surpassed the US and become the world's largest automobile producer and consumer. China had over 200 million registered private passenger cars by 2018. The rapid increase in private car ownership has brought social problems, such as deteriorating local air pollution, traffic congestion, and energy security concerns. (Liu et al., 2020) Therefore, the Chinese government has developed an increasingly stringent suite of strategies to suppress and eventually abolish the production and use of ICE vehicles. (Huang et al., 2021, p. 2; Trencher et al., 2021, p. 16) One typical measure is the limitations of the license plate issuance for traditional cars.[54] Accompanying measures include limitations on ICE vehicle use on certain weekdays[55] or during periods of heavy smog and the currently developing no-go zones for ICE vehicles. (Trencher et al., 2021, p. 16; Li, 2019)

[53] This is another affordability-related factor that was not covered in the affordability chapter. Acquiring plate licensing can be expensive in some cities in China. For example, the average auction price for a car license plate in Shenzhen, Guangdong province is RMB95,000 (US $14,500) in 2017. (Liao, 2017) The exemption from purchasing a high-cost license plate translates into considerable savings. (Kalthaus & Sun, 2021, p. 482) At the same time, it can take months, if not years, to get a license plate in some major cities for a petrol engine through various auction and lottery systems. (Harper, 2021) In contrast, the Chinese government offers free license plates for EVs, which are guaranteed. (Harper, 2021) It is uncertain how long the policy will last, as it changes fast. Shanghai has recently abolished relevant preferential policies for purchasing budget microcars discussed in the previous chapter. Nevertheless, it is still a significant financial consideration for people in many parts of China.

[54] Shanghai began to auction motor vehicle licenses in 1994, and Beijing began to grant vehicle registration via a lottery system in 2011. As of June 2016, seven cities (Shanghai, Beijing, Guangzhou, Guiyang, Tianjin, Hangzhou, and Shenzhen) had restricted the purchase of ICEVs through a series of measures such as license auctions and lottery systems. (Ma et al., 2017, p. 611) For example, the average lottery winning rate in 2019 was 0.039 per cent. (Chi et al., 2021, p. 2)

[55] To tackle air pollution and traffic congestion, more than 20 cities in China have implemented road space rationing based on license numbers, meaning that only certain license plates are allowed on the road on certain days.

Limitations on traditional cars have, as a result, indirectly made electric cars the only option for many to keep their access to automobility. An increase in EV sales thus followed despite EV's shortcomings, as noted in early chapters. (Trencher et al., 2021, p. 16) Some argue that apart from purchase subsidies, the other critical means currently employed by the government to facilitate mass EV adoption in China is the vehicle licensing policy and accompanying access-related priority enjoyed by EVs. (Huang et al., 2021, p. 2; Conway et al., 2021, p. 5; Ouyang et al., 2020) The restriction on ICEVs resulted in the increasing popularity of electric cars. It is interesting to note that amongst the top six cities for EV sales in China, five have implemented policies to restrict ICE vehicle purchases (Ma et al., 2017, p. 611), implying a strong correlation between people's willingness to pay (WTP) for new energy vehicles (NEV) and license plate restriction policies in certain cities. (Xiong & Qin, 2022) These cities are, amongst others, Beijing, Shanghai, Guangzhou, Shenzhen, and Hangzhou, which are cities where EVs are best "accepted".

This has shed light on the motivation behind adopting EVs for some Chinese people. The online observation shows that one of the most frequently mentioned motivations shared amongst Chinese people to adopt an EV despite its prominent shortcomings at the early stage of development is the restriction policies on car ownership and number plate purchase. Features of early adopters of innovative technology such as trust in new technology are less visible amongst many Chinese EV users. This is in line with Wang et al. (2017b) and Li et al. (2019) that find strong connections between restrictive policies on oil-burning cars and EV diffusion in China. In other words, many early EV adopters in China, especially those in major cities with restrictive ICEV policies, can only keep their access to automobility by becoming early EV adopters.

Within all the data collected on Zhihu, nearly everyone who shared their EV-using experiences mentioned avoiding vehicle restrictions as one of the primary reasons for adopting an EV. Zhihu user 张抗抗, an Xpeng P7 owner, said that since he has moved to Shanghai, an EV has become the most practical choice, as it would save him at least RMB90,000 (around £10,000), which would otherwise be spent on a number plate. Compared with high costs and months, if not years, of waiting, a free, immediate, and guaranteed plate becomes more appealing, or even the only access for many people to automobility. Likewise, 虎嗅薔薇 shared a similar

experience of waiting for a number plate for years and had no choice but to turn to EVs. Tesla user 逸杯二锅头 even said he was not planning to purchase an EV at all.

> I was not planning to get an electric car. I have registered for the license number public lottery for many years and still couldn't get one. The number of people registering for the EV plate lottery is getting bigger. I was afraid that I would miss it too, so I changed my registration to EVs and got my plate early this year. (本来不想买电车，可是油车摇了好几年，根本摇不上。看着排电车的人越来越多，也怕以后和油车一样，连排号都排不上了，所以当时赶紧切到电车排队，今年初排到号。)

China’s rapid development of the EV industry is primarily due to its strict top-down approach and ambitious national policies. (Pelkonen, 2018, p. 1) The ability to apply an “iron fist” of Chinese policymakers can hardly be copied in other countries due to the “vertical and single-party nature of China’s political apparatus and its control over sub-national governments, state-owned enterprises, and even private firms. (Trencher et al., 2021, p. 20) As one interviewee in Trencher et al. (2021, p. 20) commented on the unique power enjoyed by the Chinese government: “In other countries, these policies are not easily introduced. Can you imagine in Japan if they [the state] said, “You cannot drive your car on Thursday?” As China’s aggressive EV policy helps attain the national goals of increasing EV uptake, mistrust and doubts due to the immaturity of the market and the policy-driven orientation of the development are embedded in people's minds.

8.2.2 EV charging dilemma

As noted in the discussion in the availability chapter about the ontological security-empowering factors of owning an EV, especially premium models, many EV users in China share similar features: owning an EV as a complementary car; having private charging without concerns about public charging; not located in the very northern part of China where extremely low-temperature winters are experienced; and free from long distance daily commute needs. Some can even afford to treat it as a toy rather than a necessity for essential mobility. These features are all related to the freedom of charging. Apart from the financial issues, as discussed

in the affordability chapter, charging freedom that has not been achieved by the early adopters leads to a sense of powerlessness amongst them.

Some factors have contributed to the reality that the number of charging piles and EVs "are seriously mismatched." (Wang et al., 2021, p. 2) Fast urbanization and the development of the automobile industry are important factors. Against the backdrop of "urbanization and motorization develop in China", access to vehicle parking has become an increasingly severe problem in urban areas. (Ou et al., 2018, p. 108) According to statistics released by China's National Development and Reform Commission (NDRC), the country now faces a shortage of over 50 million parking spaces. The lower ratio of parking spaces to vehicles (0.8 in larger cities and 0.5 in smaller ones on average), compared with "the norm in richer countries" of 1.3 spaces per car, demonstrates the intensifying conflict between urbanization and motorization in China. (Sun, 2017) The limited parking space means limited space for installing EV recharging facilities. Currently, China's EV uptake is often concentrated in densely populated urban areas. (LaMonaca & Ryan, 2022, p. 2) "Insufficient parking space, along with the current reality that most EVs sales occur in highly congested metropolitan areas such as Beijing and Shanghai, partly leads to the limited EV charging infrastructure, which can be a critical bottleneck to the large-scale EV adoption." (Ou et al., 2018, p. 108)

Besides public charging infrastructure, the private home-charging facility is also essential. Research has found that most EV owners prefer to charge at home at night, followed by workplaces, and finally, in public places. (Wang et al., 2021, p. 2) They are, as a result, "highly concerned about the installation of private charging piles."（Wang et al., 2021, p. 15) However, the reality is that most households in urban cities do not have their own parking space. (Ou et al., 2018) Unlike in Western countries, most residents in urban areas live in flats rather than houses in China. This means parking spaces can be very limited. A high share of urban residents living in apartment-style housing leads to a shortage of access to off-street parking and EV charging. (LaMonaca & Ryan, 2022, p. 2) Without a dedicated parking space at home or prohibited from installing their own charging facilities, many households cannot access their own charging facility at their residence. (Huang et al., 2021, p. 2)

Relevant policies have recognized the importance of private charging. For example, the Guiding Opinions on Accelerating the Construction of Urban Parking Infrastructure (关于加

快电动汽车充电基础设施建设的指导意见) issued by General Office of the State Council (2015) requires all new residential parking lots to provide the infrastructure for EV charging. However, obstacles still exist in the installation of private charging piles. Amongst them, the surprisingly "popular" one widely discussed online comes from community property management, especially in old residential compounds. According to relevant policy, families are required to have a fixed parking space within the residential compound to obtain consent from the community property management in installing their private charging pile. Once consent is obtained, they can apply to the electric power bureau to finish the installation. (Wang et al., 2021, p. 11) Many communities cannot provide residents with fixed parking spaces due to limited parking spaces. Additionally, many properties refuse residents' applications for the installation of private charging piles due to charging safety concerns. (Wang et al., 2021, p. 11)

A survey conducted by D1EV in 2019 amongst EV users showed that numerous discussions and experiences shared revolve around getting consent from the community property management and the obstacles people experience during the process. Amongst the users involved in the survey, 73 per cent of the car owners cannot get their private charging pile installed, including 44 per cent of them attributing the reason to the lack of fixed parking space and 38 per cent blaming it on the property management. The survey also demonstrated that amongst those who have successfully installed their private charger, 52 per cent experienced resistance from the property management. Among the 73 per cent who have not had their private changer installed, only 26 per cent were still negotiating with their community property management, 37 per cent felt helpless, and 37 per cent gave up totally. (D1EV, 2019) The survey statistic indicated difficulties facing Chinese EV adopters to own their private charging pile.

Apart from resistance from community property management, the hidden wealth threshold is high. The hidden "wealth threshold" to own a private parking space hinders people's access to the freedom of charging. It can be costly to purchase a private parking spot, which is necessary in most cases to install a personal charging pile. As Zhihu user 一袋米要扛几楼 said, "owning a private charging pile means spending at least an extra RMB 200,000 (around £22,000) on a parking spot." A popular term "electricity area house/flat (电区房)."[56] is frequently mentioned

[56] The term was coined by NIO in 2021 to describe residential areas that are within three kilometres of NIO's battery-swapping station. The term is similar to a more popular term called "study area house/flat (学区房)",

in the discussions, indicating the high economic threshold of owning EVs.

Not being able to afford private charging facilities as a critical threshold of getting access to EVs is given broad attention amongst the Chinese early adopters, which can be well noticed in the data collected in this research. 逸杯二锅头 complained about his charging experience as a "forced" early adopter without access to private charging on Zhihu. His complaints sparked strong reactions from other Tesla users. 逸杯二锅头 is based in Beijing, where the public charging infrastructure is believed to be relatively well-developed compared with most cities in China. The lack of access to a private charging facility forced him to choose public charging points. As noted in the availability chapter, the frustrations of using public charging facilities render the user helpless. For example, 逸杯二锅头 highlighted the long waiting time for using the Tesla supercharger. Tesla supercharger is the fastest available charging for him. However, he must wait every time he goes to a supercharging station, as many people will be queuing in line to get charged. Unlike refilling fuels at a gas station, recharging an EV takes at least one hour, even at a supercharging station. This normally means a very long waiting time.

The deprivation of autonomy of using a private car is also demonstrated in his charging experiences in shopping malls, which is the most effective public charging option apart from Tesla supercharger stations. Time control was challenging as he would be charged extra if he did not move his car after the charging was complete. In the beginning, he decided to enjoy the time in restaurants in the shopping mall while waiting for his car to get charged. Since some restaurants are often packed with customers, people usually have to wait for a table. It is, therefore, challenging to do time control. Due to this awkward situation, he later decided not to enter the shopping mall and waited in his car instead. Most shopping malls have underground car parks. Waiting in the car to get charged can be tedious, as the phone signal can be terrible at underground parking lots. All his shared experiences echo the "electric dad" notion noted in the availability chapter.

The vivid and detailed charging experience shared by 逸杯二锅头 pointed to some real problems facing public charging in China. 逸杯二锅头's post received 391comments by the time of data collection. Many EV users based in different cities joined in the discussion. Some

which describes residential areas with schools or universities nearby so that the areas are often pricier. "Electricity area house/flat (电区房)" in this case is used to indicate that residential areas with sufficient charging infrastructures are often more expensive.

shared similar exhausting charging experiences, such as lining up for charging at charging points, especially in cities with strict license plate restrictions. Tesla user 车险-琳琳 does not own a private charging pile either:

> All nearby parking space with charging piles is either used by other EV users or occupied by fuel vehicles. I can only go to a park far away from home and wait for hours to get my car charged. It is very depressing…if there is a traffic jam, my car can only run for over 100 km, so I need to charge daily. The disappointment of owning a Model 3 is N times bigger than the surprises. (近的充电桩不是有人充就是被燃油车停了车位，只能去偏远的公园停车场充电，然后等几个小时，很郁闷。开了空调和堵车续航只有一百多，每天都要充电，买了毛豆 3 失望比惊喜多了 N 倍。)

Some other Zhihu users expressed their concerns about public charging in general. For them, finding a parking spot in big cities is already challenging, let alone one with a charging pile where one person can park and charge for hours. As the number of EVs increases, the situation can be even more challenging in the near future.

What caught the author's attention was not only the charging dilemmas but also comments received by 逸杯二锅头's post, which reflected the "common sense" has formed amongst the Chinese public that there is a hidden threshold of owning and using EVs in China. Those who vehemently disagreed with 逸杯二锅头's post believe that 逸杯二锅头's decision to purchase an EV without a private charging pile is the cause of all his sufferings and existing issues mentioned in the post with public charging should not be blamed. For these people, having a private charging pile is the "basic requirement" of using EVs. One commenter made an analogy, saying the author's purchase of an EV without a private charging pile is like buying an electric fan without electricity access. Others criticized the post's author as not being objective, and he could not represent the majority of Tesla users, as he did not own access to a private pile. Someone even thought that he was not a genuine user and that the post was just to depreciate the brand. It seems obvious that a consensus has been reached in the comments: a person should not purchase an EV without a private charging pile. This can lead to the tendency that those who do not have private charging at the moment should not even consider adopting an EV, except, of course, early adopters like 逸杯二锅头 who have no choice but to accept it in order to maintain their basic mobility due to strict automobile policies discussed above.

8.3 Insecure early adopters

Based on the observation of struggles facing Chinese early EV adopters discussed earlier, this section will propose an alternative understanding of innovative technology early adopters, calling for more attention to their security needs. The argument of this section will shed light on the substantial barriers keeping the mass public from accessing EVs. The theory on diffusion of innovations by Rogers (1962) classified consumers into groups depending on their likely timing of adopting an innovation. Early adopters, the second category in Rogers' classification right behind the "innovators", are expected to comprise about 13.5% of the adoption population and are characterized as opinion leaders. (Nopper et al., 2015, p. 75) They are the early customers amongst the public to adopt a new product or a technology before the majority of the population does. Early adopters constitute a pivotal group driving the momentum of technological development along with political and business players. Since they are the adventurous ones who serve as a beacon of light for the rest to follow, they are often called "lighthouse customers". Previous research has identified that psychological factors such as risk assessment, liability, fear, and safety concerns may affect public acceptance and, in turn, the uptake of new technologies. (Otway & Winterfeldt, 1982; Clothier et al., 2015) Normally, early adopters are referred to as those who willingly expose themselves to the latest development, with which comes risks and uncertainties. Based on the online observation of access-related barriers discussed above, this section will argue that some early adopters, who usually are perceived ontologically more secure, are not secure in the context of China's EV development, which will help illustrate the human security implications of the barriers facing the Chinese public in accessing the empowering features of EV mobility.

8.3.1 Early adopters with stronger ontological security

The characteristics of the early adopter echo those with stronger ontological security in two ways: trust and coherent self-identity. Living in a world with increasing insecurity, early adopters have a stronger sense of security than the vast majority. These signs, the substantial amount of trust and a coherent self, can be detected in the mainstream conception of early adopters of innovative technologies. Trust is an essential notion in Giddens's analysis of modernity. The lack of trust stands out in the post-traditional order, in which knowledge is

constantly revised and “may have some point to be abandoned”. (Giddens, 1991, p. 3) “In circumstances of uncertainty and multiple choice, the notion of trust and risk have particular application.” (Giddens, 1991, p. 3) As people face uncertainties and multiple choices in meeting their automobility-related needs, trust becomes essential. It gives people a sense of security as a “protective cocoon”, with which people can go on with their life choices. Trust, therefore, is a prominent characteristic of people who are ontologically secure. It is an empowering tool for people facing uncertainty and risks.

Early adopters are perceived as showing more trust in facing uncertainties in life thanks to their strong ontological security. In investigating motivations behind early adopters of sustainable innovations, including EVs, some features have been captured within the existing research. Early adopters are believed to hold more belief and trust in the advantages of science and technology and express more positive attitudes towards novelties in general. (Nopper et al., 2015, p. 75; Thurner et al., 2022) They are more comfortable with uncertainties caused by technological changes. (Edison & Geissler, 2003) They have more faith in the development of society in general and are more enthusiastic about the new development. The trust they demonstrate may well come from their strong sense of security, which empowers them to embrace uncertainties and risks associated with the new technology.

A coherent self-identity, another sign of those who are ontologically secure, is also a noticeable feature amongst early adopters. The construction of a coherent self-identity, that is, to create unity from fragmentation, certainty from uncertainty, and empowerment from powerlessness” (Lackey, 1992, p. 181) can be seen as signs of an ontologically secure person. This can be applied to the common understanding of an early adopter who is usually perceived as more comfortable and confident in expressing themselves. As noted in Chapter 6, EV provides a channel for self-expression. It helps enhance their ontological security by enhancing their self-pride, or dignity in the human security narrative, and autonomy by telling the world that they have the power and courage to embrace the uncertainties and potential risks coming with the immature technology towards which the majority of the population are still hesitated to accept. Thurner et al. (2022, p. 412) present that early adopters hold strong self-expression values. They enjoy the strength of expressing themselves freely and being comfortable choosing their

preferred lifestyle without the fear of being judged, which can be a significant barrier to forming a coherent self.

8.3.2 Insecure Early adopters

This above understanding of early adopters, however, can be challenged by the life stories of some Chinese EV early adopters discussed in the previous section who were "forced" to make a choice. Compared with traditional vehicles, there are fewer options available for people to choose from. Purchasing an EV becomes the most direct and easiest way to meet people's essential mobility needs in cities where strict vehicle regulations are imposed, even though it is not sure how long this "privilege" of EVs will last, as the numbers of EVs in some first-tier cities are surging. They have been forced to be open-minded and adventurous to embrace the new mobility idea even without the trust and belief identified amongst typical early adopters of new technologies. They are not given a chance to be close-minded about the new technology as most people are in innovative diffusion. (Moore, 2002) Their experiences of being forced to be ontologically secure enough to accept the new mobility idea just to maintain essential daily mobility tell a less empowering story of being an early adopter. Negative feelings of the Chinese people can be understood as anger or sadness at being ripped away from the power of choice they used to have in choosing their mobility. For these Chinese EV early adopters who face restrictions on ICE vehicles and have no other option to choose other than electric cars, the drawbacks and potential risks of adopting EVs are still drawbacks and risks, if not worsened, unlike those mentioned in earlier chapters who even expect the drawbacks to show their identities. The adoption does not make them feel more secure. Even though for many the restrictions make sure that some people get to temporally keep their automobility, which constitutes an important element for people to achieve mobility freedom, the ontological security-empowering feature of being an early adopter, however, is less visible to these people. Instead, the EV adoption experience brought them more uncertainties and powerlessness to the detriment of their ontological security.

Conclusion

This chapter discussed factors affecting accessibility to EVs through the eyes of Chinese early EV adopters. Together with the financial factors discussed in the affordability chapter, this chapter depicted a finer picture of people's access to EVs within the unique context of the Chinese society. As repeatedly mentioned in previous chapters, this research by no means aims to explain in a complete manner all considerations under each of the As. The goal is to capture the Chinese people's biggest concerns. Based on the observation of the Chinese early EV adopters who… do not have access to private charging and experience frustrations with public charging, this chapter proposed an alternative understanding of early adopters who are less secure ontologically, which has helped reveal the high threshold and barriers to full access to EVs in China.

Chapter 9 Acceptability

Introduction

Discussions in the previous three empirical chapters have focused on the empowering /disempowering aspects of China's EV development within the discussion of human security. They have addressed broader issues concerning *freedom from want*. This chapter on acceptability aims to remind the reader that the connection between the two keywords of this research, namely human security and China's EV development, is also underpinned by conventional security considerations on physical safety. This chapter will explore the acceptability of EVs by reverting to a more traditional understanding of security that emphasises its existential nature, or *vital core* in the human security narrative (Alkire, 2003) and focusing on two fundamental issues concerning China's EV development that pose existential threats to human security: environment and driving safety.

The adoption of EVs is well portrayed in the energy transition narrative as the solution to the automobile-related climate issues (IEA, 2016), which are attracting increasing attention as climate change has been labelled by world leaders and academics as an "existential threat". (UN, 2018; Moseman, 2021) Apart from the alarming climate change, smog pollution, closely related to China′ s rapid increase in automobile uptake, poses severe health risks to the Chinese people. (Sajjad et al., 2020, p. 33774) Safety issues around using EVs are also directly connected to the physical security of the Chinese people. As will be discussed later in this chapter, driving safety concerns, caused by various reasons and actors, constitute a significant barrier to Chinese people's acceptance of the new mobility option.

It is constantly stressed "that a user- and usage-oriented view can make an essential contribution to acceptance". (Fraedrich & Lenz, 2016, p. 621) By tracing public perceptions in EV-related online discussions from the two perspectives mentioned above, this chapter will address acceptability based on the idea of *vital core* and explore if the so-called environmental benefits of EV development, which presumably bring the public a sense of environmental

security, make EVs more acceptable among the Chinese people; and how barriers to China's EV adoption have been created due to the broad safety concerns.

9.1 Defining acceptability – environmental and driving safety considerations

The previous three chapters (availability, affordability, and accessibility) discussed the empowering/disempowering characteristics of the automobility transformation influencing human fulfilment. In other words, the security discussion so far has been around the broad understanding of human security that stress less on existential threats. It is important to note that physical security, which is usually examined within the realm of traditional security understanding, should not be ignored in a human security discussion, not least because, as will be discussed in detail in this chapter, physical security considerations have shaped Chinese people's perceptions of how secure EVs are, and thus how acceptable they are. This chapter will, therefore, interpret acceptability through the notion of *vital core* in the human security narrative with an emphasis on the existential security considerations brought by EV development in China.

The notion of *vital core* has been emphasised in human security conception. The objective of human security is to "safeguard the vital core of all human lives from critical pervasive threats…" (Alkire, 2003, p. 2) Elements of the vital core are "fundamental" and "rudimentary" freedoms as to their survival, livelihood, and dignity. (Alkire, 2003, p. 3) The human security definition, however, does not specify or prioritise certain forms of freedom beyond identifying the three categories. (Alkire, 2003, p. 3) "What people consider to be 'vital'—what they consider to be 'of the essence of life' and 'crucially important'— varies across individuals and societies." (UN Commission of Human Security, 2003, p. 4) Through the lens of acceptability, this chapter aims not to prioritise specific themes as the vital core but to demonstrate that considerations regarding existential threats should not be ignored in this human security puzzle even though the broad approach has been adopted. While what vital core entails has to be specified in each context, it is undebatable that physical security is on the list of vital interests and core values for individuals as the fundamental building block of survival, livelihood and basic dignity.

Existing literature and data collected in this research have pointed to two areas of EV development - environment implications and driving safety in this physical security-related inquiry under the label of acceptability. The following sections of this chapter will explain how the two areas are survival-related, why they are chosen in this chapter to study EV acceptability and, more importantly, in what ways they have shaped Chinese people's perceptions regarding how secure and thus acceptable EVs are.

9.2 Environment and acceptability

9.2.1 Acceptability as environmental acceptability

As noted in the introduction, security threats posed by energy use-related climate issues are now labelled as existential, not only because the cataclysmic consequences of the temperature rise have the potential to threaten the continued existence of human life but also as evidence has shown that the social and environmental determinants of human health such as clean air and secure shelter have already been affected. A host of human cultures, traditions and languages are already facing immediate and existential threats. (Moseman, 2021) For example, shorter winters and the decreasing sea ice coverage in the polar region caused by the unprecedented warming rate have forced the indigenous Intuit to adapt their traditions, cultures, and "rhythm of life" built upon ice and snow. "Shrinking ice packs and more severe weather has made travel increasingly difficult and dangerous, often cutting people off from other communities and traditional hunting lands." (Mercer, 2018)

In fact, acceptability has always been understood as the environmental impact of energy systems in the energy security narrative. The parameter of acceptability is exclusively translated into environmental acceptability in the APERC's 4As framework of energy security as it deals with 'energy-related environmental impacts' along with the increasing energy demand. (APERC, 2007, P. 27) Inspired by the APERC research, the following energy security conception research has used the 4As framework and equated acceptability with environmental acceptability. (Kruyt et al., 2009; Hughes, 2012) Even for studies that did not adopt the term

"acceptability", similar expressions such as environmental sustainability have been adopted as indicators of energy security analysis. (Chester, 2010) The environmental issue has been closely entangled with energy security discussions. (Cherp & Jewell, 2014, p. 415) Its incorporation into the energy security concept has been regarded as possibly the most serious challenge to traditional energy policy thinking. (Von Hippel et al., 2011, p. 6722)

What the APERC research did not clarify in the analysis of environmental acceptability is the referent object. Even though nobody can escape the repercussions of environmental degradation, "what is environmentally acceptable varies widely among different actors: local population, environmental NGOs, industries, and nation states." (Cherp & Jewell, 2014, p. 417) Adopting a people-centric approach, this chapter will investigate the environmental acceptability of EV development among the Chinese public, presuming that environmental security acts as a vital core for the Chinese people.

Alongside the alarming climate crisis, it should not be ignored in China's context that the country is under great pressure to alleviate severe environmental pollution problems and mitigate ecological damage due to years of extensive industrialisation and urbanisation. Environmental insecurities experienced by the Chinese people are presumably more evidently caused by domestic pollution issues, including air pollution that is most relevant to automobile energy consumption. Both quantity and quality of life are impacted by pollution exposure in China. Ebenstein et al. (2015) argue that air pollution constitutes a key explanation for the fact that the life expectancy increase in China has been less than predicted, given its per-capita income growth. Air pollution has exposed Chinese people to severe respiratory diseases. (Qiu et al., 2018; Sajjad et al., 2020, p. 39774) long-term exposure to unhealthy air has also negatively impacted mental health among the Chinese people. (Zhang et al., 2017)

In the APERC research, acceptability addresses if the security risks posed by adverse environmental impacts of energy development are acceptable. Replacing traditional fossil fuel-burning cars with electric ones is widely promoted as a solution to environmental degradation while increasing environmental security. It is widely believed as a solution to the environmental risks facing human security. (IEA, 2016) Due to the close connection between EV development and efforts to fight climate change and alleviate air pollution widely discussed in the literature, news, and official reports, as will be discussed later in section 7.2, this research is interested in looking into how the environmental factor matters in this human security puzzle.

Since an acceptance object is always evaluated in relation to an existing system of norms and values (Fraedrich & Lenz, 2016, p. 626), the question to address here under the label of acceptability is: does the Chinese government's determination to replace gasoline cars with electric ones make Chinese people feel more environmentally secure, thus rendering EVs more acceptable?

9.2.2 Alternative interpretation of the connection between environmental security and EV adoption in China

A growing body of research has examined Chinese people's environmental awareness in the context of EV development, assuming that environmental concerns, due to China's severe air pollution in metropolitan areas, may encourage greater EV adoption intention. The findings are, however, inconsistent. Some have found that great environmental concerns are positively linked to EV usage intentions and positively affect consumers' acceptance of EVs. (She et al., 2017) Some even argue that environmental awareness constitutes a significant determinant of EV adoption among Chinese early adopters. (Chu et al., 2019) There are, however, different opinions. He et al. (2018) concluded that the effect of the perceived environment on consumer EV purchase intention was insignificant.

A well-known "attitude-action gap" has been identified in existing studies of people's consideration of EV adoption. (Lane & Potter, 2007, p. 1090) When explaining the surprisingly insignificant effect of environmental awareness on EV uptake intention, He et al. (2018) pointed to the "powerlessness" among the public. The research argued that while being aware of the environmental attributes of EVs, consumers do not believe that their efforts to purchase an EV could make a difference in protecting the environment. (He et al., 2018, p. 1066) The online observation conducted by this research provides another understanding, which puts the public awareness identified in He et al. (2018) among the Chinese public of the environmental benefits of China's EV development into question. That is, are Chinese people aware that EV development in China is an effective solution to environmental insecurities? In other words, do they believe EV development will make them more environmentally secure?

The online observation conducted by this research provides an alternative interpretation regarding the connection between Chinese people's environmental security perceptions and EV's presumed environmental benefits. The argument that consumers are aware of the

environmental attributes of EVs is against the observation of this research. There are much fewer environment-related EV discussions than those around other considerations shaping EV adopting intentions such as costs, car performance, brands, and accidents involving EVs, which has been a widely discussed topic concerning EV safety and will be discussed in detail in the following section. The public discussions on Chinese social media demonstrate a lower public interest in the environmental benefits of EV development.

Among all popular EV-related discussions on Zhihu (https://www.zhihu.com/topic/19561561/hot) [Accessed 16/07/2022], which have been categorised under the labels of *hot (讨论)* and *top-answers (精华),* only two threads of discussion focus on environmental considerations at the time of writing this chapter.[57] Within these two threads of discussions, some features can be noticed, which are indicative of how the presumed environmental benefits of EV development are perceived among the Chinese public. Under the question*, China's thermal power generation accounts for nearly 75%, so electric vehicles are not environmentally friendly, right? (现在中国火力发电占比接近75%，所以电动汽车是不环保的，对吗？),* https://www.zhihu.com/question/422957444 [Accessed 12/07/2022] some most liked answers are from experts who work in related areas. From a professional perspective, they gave mixed answers supported by scientific data and academic studies, with a majority of them arguing that it is always better to deal with the exhaust in integrated ways at power stations than allowing car exhaust to harm people's health in urban cities. Some working for the grid system also stressed that with the improving energy efficiency and the more restrictive emission policy, coal-fired power plants in China are getting much cleaner. Others disagree with them and emphasise battery-related pollution, stressing how EV batteries produce more damage to the environment.

Some professional and academic explanations for the potential impacts of China's EV development on alleviating air pollution are provided with the above answers. This is expected due to Zhihu's professional user base. It is, however, worth noting that both threads of discussions revolve around the term *environmentally friendly (环保).* In other words, the

[57] It is important to note that these two threads are not the only environment-related discussions concerning EVs on Zhihu. All threads of discussions incorporated under the two labels by the Zhihu platform are those that have attracted the most public attention. They are where an ordinary Zhihu user interested in EVs is most likely to spend time reading and joining in the discussion.

presumed environmental benefits of EVs regarding tackling domestic air pollution issues and fighting climate change by curbing GHG emissions are not distinguished as observed in the online discussions. As will be noted later, others answered the same questions by focusing on the other side of the story, China's current coal-intensive energy mix, and thus led to different conclusions by stating that the development is not contributing much to fighting climate change. The blurry boundary between local air pollution and global climate change discussions can be well expected, as air pollution and climate change are often conflated in official documents and reports in China. One clear piece of evidence is that in the *Green paper on climate change: a report on fighting climate change 2013*, published by Social Sciences Academic Press, local air pollution was emphasised, and China's haze issue was systematically explained: "…the problem of haze and fog in China was hitting the record level, and China is currently suffering the worst air pollution problem since 1961." (Wang & Liu, 2014, p. 1265) For clarity purposes, this chapter distinguishes the two aspects regarding EV's environmental implications identified in public opinion with an aim to depict a clearer picture of the relationship between China's EV development and the environmental security experienced and perceived by the Chinese people.

Another popular group of answers, interestingly, questioned the question itself. Some even called the claim in the question, *now China's thermal power generation accounts for nearly 75%, so electric vehicles are not environmentally friendly,* a pseudo-proposition (伪命题), indicating that the question itself is meaningless, as they argued that the environmental benefits are not within fundamental motivations of the Chinese government to develop EVs compared with other strategic considerations such as energy security and automobile industry upgrade. As Zhihu user 温酒 posted, "if new energy [vehicles] are environmentally friendly or not has always been a secondary consideration, a pseudo-proposition. The main concerns are to reduce oil dependence and to have more say [in the world automobile industry] (新能源的环保从来是…次要矛盾，伪命题。主要矛盾是减少石油依赖，争取更多话语权)". Some mentioned that EV development is part of the large picture of China's energy transformation plan. The purpose here is not to judge the correctness of the information conveyed in these answers but to trace the signs of the assumed "reassurance" and "hope" among the Chinese people brought by EV development in the face of a deteriorating environmental crisis.

The observation in this research shows no sign that the environmental credits of EVs constitute a major driving force for EV adoption among the Chinese public, as the supports shown in the

discussions are mainly from industry professionals whose arguments are supported by authoritative studies and reports. Similar arguments, however, are rarely seen among ordinary people. The analysis here does not deny the argument made by previous studies that environmentally conscious people are more likely to adopt EVs. It is neither a discussion on how environmentally conscious Chinese people are[58], nor how environmentally friendly China's EV industry is. What is emphasised is that the perceived environmental benefits of EV development are less visible in public discussions than expected. Instead, the data indicate that the public perceives EV development as a primary measure taken by the Chinese government to tackle other strategic issues instead of those related to the environment. In this sense, it is problematic to conclude that EV development makes Chinese people feel more environmentally secure and, thereby, more acceptable. The connection is not yet strong in Chinese people's minds. The discussion of how the individual purchase of EVs contributes to people's environmental security thus becomes less relevant.

9.3 Safety and acceptability

9.3.1 Acceptability as safety acceptability

As noted earlier, this chapter approaches acceptability based on the notion of the vital core. The online observation conducted in this research suggests that driving safety constitutes a core value in this human security inquiry. Unlike environmental issues, safety is one of the most discussed concerns observed, suggesting that safety is among the core values Chinese people uphold when deciding if EVs are acceptable at this stage of development.

Safety is directly linked to the physical security of human beings. It is an essential notion repeatedly mentioned in human security narratives: "protecting and empowering people

[58] There is clear evidence of Chinese people's environmental concerns. The number of environmental complaints filed by the public about environmental pollution to environmental authorities, as an important channel of public participation, sets a convincing example. According to *中国环境统计年鉴 (China Environmental Yearbook),* the total number of environmental online and hotline complaints doubled from 852,700 in 2011 to 1.65 million in 2015. (Zhang et al., 2017, pp. 148-149) Recent research in China has also demonstrated that people living in localities with higher levels of air pollution in China show more environmental concern. (Habich-Sobiegalla et al., 2018, p. 191)

are …about creating genuine possibilities for people to live in safety and dignity." (Commission on Human Security, 2003, p. 5) Apart from violent factors underpinned in the UN human security interpretation, technological advances along with societal changes, the transformation of automobility in the case of this research, bring new sources of safety considerations. As will be shown later, safety issues of EVs have created various security concerns among the Chinese people, which may impact the public acceptability of EVs and create barriers to EV adoption. As a fundamental core value, safety will be discussed in detail under the label of acceptability in this research.

The popular reversed attitude towards cars and car culture developed in academia were discussed in Chapter 4, inspiring researchers to look for ways to replace cars with less harmful means of transport such as public transport. The introduction of EVs brings changes to the destructive features while potential new ones are added to the list, including safety risks. Some of the risks are caused by the natural process of technological progression, which require behavioural changes from the driver, while others can be traced back to other stakeholders such as carmakers that fail to take responsibility. The pursuit of national energy security by aggressively pushing the technology progression and people's trust in the new technology has brought new human security concerns. The remainder of this chapter will examine these concerns in detail and explore how they affect public confidence in accepting the new way of transport. After all, human security is about both how secure people are and how secure they believe they are.

9.3.2 Stay safe in technological transformation via changing behaviours

This section looks into the technical changes brought by automobility transformation and the following behavioural changes required of users to ensure safe driving. As the technology progression is constantly happening, new safety concerns emerge in the new driving experiences. Drivers are required to adjust their years-long driving habits to drive safely. As will be discussed in the following sections, making changes in such daily routines as driving habits can be challenging for people from an ontological security perspective. Some widely discussed examples in China's context will be examined in this section to show how new driving behaviours are required from drivers due to the constantly developing new technology, the safety risks following, and how people perceive these changes.

Some technological improvements have required behavioural changes among drivers. For example, the transformation of the dashboard and the adoption of the central touchscreen, which are among the most noticeable features of almost all EVs, can cause distractions for drivers. As Zhihu user 南方的小李同学 pointed out in his post, some key features can only be found in submenus, such as adjusting the mirror and the driving mode, which can be a "hidden danger for safe driving (对于行车安全来说是一个隐患)". Personal adjustments are needed in the transformation process. They have sparked some safety discussions in China.

One radical change in driving experience that has brought some public attention concerns a recently launched feature of some EVs - the one-pedal driving mode. It allows the driver to move forward, slow down and bring a vehicle to a full stop with only the accelerator pedal. It is made possible and increasing in popularity among a growing number of EV models thanks to the regenerative braking system equipped in EVs.[59] The technique claims to maximise the driving range, which is so far the most significant weakness of EVs. Compared with other changes, such as introducing the central touchscreen, the one-pedal mode requires more changes in human driving habits. The safety risk of the one-pedal mode is best demonstrated when an emergency brake happens. It creates an illusion that the foot is placed on the brake pedal when the car slows down as driving a traditional car. The driver would be inclined to mistake the accelerator pedal for the hydraulic brake, which would cause unexpected acceleration when an emergency brake is needed. The popular Bilibili video of the test drive of a Tesla Model 3 Performance proved this point as the video uploader (also the test driver) experienced unexpected acceleration because of his "misoperation (误操作)" when trying to bring the car to a stop. [Fig 9.1]

[59] Simply put, when the car is braking, the electric motor is capable of converting kinetic energy from the vehicle's forward motion into electricity so that the car recaptures all potential energy as it slows to a stop. It is advertised as a way to extend the driving range of EVs. It is also believed to bring comfort and ease to the driver as keeping the foot in one place is less work than moving it between two pedals. When the accelerator is released, the car slows down much faster than traditional cars. The brake pedal is still available but mainly used for emergencies or aggressive braking.

Figure 9.1 The driver mistook the accelerator pedal for the brake when first testing the one-pedal mode of a Tesla Model 3P. People expressed concerns over driving safety in the bullet comments. https://www.bilibili.com/video/BV1yU4y1V7Ka?from=search&seid=4030506081809599666 [Accessed 22/10/2021]

This case illustrates that the introduction of new technology requires changes in behaviours of users. As will be discussed in detail later in Section 9.3.5, routine makes security, the disruption of which can cause ontological insecurity. The changing behaviour coming along with the technological progression requires people to be well aware of the changes and act appropriately to reduce the potential safety risks. People need time to adjust, both physically and mentally, to the changes required in the transformation to be or feel more secure in the new era of driving. The reality, however, is less satisfying. This habit change has inspired strong safety concerns and opposition on Chinese social media. As shown in Fig 9.1, it is even called *antihuman (反人类)* by many involved in online discussions. For experienced drivers, muscle memories are developed with repetitive driving practices. The operations of the accelerator paddle, brake paddle, and shift level are engrained in their body. It takes time for a traditional driver to adapt to the new driving model and change driving habits accordingly. In Chinese people's perception, the major consideration of developing the one-pedal mode is to increase the driving range, which is still considered a major shortcoming of EVs compared with traditional cars. Some blame the carmaker for sacrificing safety for the driving range. Pushing the transition process can lead to deadly consequences on the road. The bullet comments in Fig 9.1 demonstrate

people's safety concerns and even anger. One comment suggested that people now need specific training to drive a Tesla (开特斯拉需要培训了).

As new users are unsure about the changes and ask for more guidance, it is, at the same time, carmakers' responsibility to keep a good balance between pushing forward the development - introducing new features towards fully autonomous and providing adequate safe operation guidance and monitoring system for ordinary drivers. Carmakers should be aware of and take into account the security risks associated with new features to fully prepare the public for the proper use of the new technology. The next section will explore if the carmakers are taking responsibility for dealing with emerging security concerns and examine if they are the protector of people or the source of security risks.

9.3.3 Carmakers – the guardian or the devil?

As discussed in the availability chapter, the vision of autonomous driving is to enhance human autonomy by making mobility services available to everyone. The advanced driver assistance system (ADAS) equipped on some EV models has positive human security implications, as it has achieved its goal of advancing convenience and assisting the most burdensome parts of driving by "giv[ing] you the time back to be everything you want to be." (DP Cars, 2017) A multitude of new forms of autonomy is unlocked in terms of what one can achieve with access to an intelligent mobile space with multiple functions and unprecedented possibilities. However, the promise made by many intelligent EV makers of improving driving safety with the development of autonomous driving, as shown on their official websites [Figure 9.2], is debatable.

Figure 9.2 “Safer, easier, and more convenient: Standard Li Auto AD (assistant driving) system”. Li Auto official website. https://www.lixiang.com [Accessed 29/10/2021]

The problem can be the promise itself. One example of carmakers failing to keep a good balance between pushing forward the development and providing adequate safe operation guidance for ordinary drivers is the misleading promotion information that exaggerates the capabilities of their cars. People's perception is closely related to how the information regarding automobility transformation has been transmitted. The misleading information boasted by EV makers for commercial propaganda does not protect people from the risks. Instead, their statement has been too promising for people to properly comprehend the technological progression and the safety risks embedded. The exaggerated publicity by EV makers constitutes a security threat towards ordinary people.

A major area of exaggeration happens in the ADAS equipped on most premium EV models. The classification system published by the standardisation body Society of Automotive Engineers (SAE) identifies “six levels of driving automation, ranging from no driving automation (Level 0) to full driving automation (Level 5)”. (SAE, 2021) The promise made by carmakers of freeing people’s hands can only be achieved with full automation (L4 or above) when the car can perform a driver’s role without the need for human intervention. All premium EV models available on the market equipped with the ASDS are currently on L2. Even though full autonomy (L4 or L5) may still be years away, ASDS is often deceptively promoted as a self-driving feature.

The war among competing players in car promotion has led to the spread of exaggerated, contradictory, and even false information regarding the capability of the assistant system. All existing driver-assistance systems are on L2, which still requires all-time human supervision and intervention when necessary. Most premium EV brands are competing in developing the latest autonomous driving technology partly because they cannot afford to be perceived by consumers as lagging in this technology-based industry. It has been normality for carmakers to adopt more hyperbolic terminology marketing gimmicks. The "autonomous" element is often highlighted, while the "assistance" part is intentionally weakened. Terms such as "L2 driverless" are used by carmakers in their publicity to falsely promote their ASDS as fully autonomous. In fact, Autopilot was literally translated into "self-driving (自动驾驶)" on its official website. It was after some Autopilot-related incident happened in China that Tesla removed the expression of "self-driving" from its China website. (Spring & Sage, 2016) Similar "promoting strategies" of overplaying the feature's capability have been repeatedly used as recently the name of Tesla's latest driver assistant system "Full Self-Driving" (FSD)" is under growing scrutiny. It is, however, still claimed by Tesla as an ADAS rather than an autonomous system. (Jin, 2021) Instead of taking adequate driver monitoring measures to prevent people from misusing the feature, Tesla has been criticised by consumer groups and experts for misleading consumers into believing and over-relying on the car. (Jin, 2021)

Similar conflicting official information involving terms like "autonomous" and "assistance" can be seen in the company's publicity. Even though it is mandatory for drivers to keep their hands on the wheel all the time while driving, the demonstration video on Tesla's official website tells a different story. At the beginning of the demonstration video of Tesla's Autopilot, it was emphasised that "the person in the driver's seat is only there for legal reasons" instead of safety reasons. It continued, "he is not doing anything. The car is driving itself." The requirement of full-time supervision is totally ignored. The person's hands were in the preparation position the whole time in the video without touching the wheel, indicating the person was supervising the car's operation. [Figure 9.3] This is how Autopilot is demonstrated on Tesla's China website. Compared with the statement at the beginning of the video, the real-person demonstration involves more safety considerations. However, in the demonstration video on Tesla's main website, the person's hands were resting on the lap, consistent with the statement that "he is not doing anything". [Figure 9.4]

Figure 9.3 Autopilot demonstration video on Tesla's China website. https://www.tesla.cn/autopilot [Accessed 26/10/2021]

Figure 9.4 Autopilot demonstration video on Tesla's main website. https://www.tesla.com/autopilot [Accessed 26/10/2021]

The exaggerated autonomous driving myth is spotted not only in official information but also in some more publicly accessible ways. Compared with formal information on official websites, the message conveyed on social media by influential individuals can reach a larger audience and thus be even more misleading. Elon Musk was criticised by Tesla's director of Autopilot software for his overstatement of the capabilities of the company's assistive driving system that does not match engineering reality. (Hawkins, 2021) Shen Fei, vice president of NIO, once posted on Weibo about him having food while allowing the vehicle to "automatically drive" at high speed. [Figure 9.6] As an executive of NIO, Shen was criticised by netizens for using confusing words such as "automatic assisted driving(自动辅助驾驶)" to exaggerate NIO's assistive functions. Now the Weibo content has been deleted.

Figure 9.5 “With the help of automatic assisted driving, you can safely eat when driving.” https://finance.sina.com.cn/chanjing/gsnews/2021-08-15/doc-ikqcfncc2969953.shtml [Accessed 27/10/2021]

The information above demonstrates that misleading information from carmakers hinders people from comprehending the full breadth of the capabilities of the autonomous driving system. Car manufacturers increasingly set big targets and make ambitious public promises of technology breakthroughs. However, a fully autonomous car that can drive everywhere under all conditions is a long way off. Li Xiang, founder and CEO of Beijing-based EV startup Li Auto, argues that unified terminology is needed in describing assistive and autonomous driving technologies in the EV industry and mass media. The “hyperbole” in marketing should be avoided. (Zhu & Zhang, 2021)

This section looks at the risky human security implications of spreading confusing and contradicting information by car makers. Excessive publicity and advertising driver-assistance as autonomous driving encourage the potentially dangerous misuse of the feature by drivers. (Zhu & Zhang, 2021) As will be shown later in the section, the analysis of accidents involving smart EVs, blurry and conflicting perceptions of the capabilities of ASDS, and the accompanying public concerns over its safety indicates that the general public may have to pay the price in the process towards fully autonomous driving before enjoying the freedom and autonomy provided by it. The driver’s lack of proper knowledge and misuse of the new

functions caused by the misleading information given by carmakers pose new human security threats.

Tesla's first known car accident involving its Autopilot system in China happened in 2016 when Chinese Tesla owner Luo Zhen crashed into a parked vehicle on the road. In response to Tesla's claim after the accident that drivers have been informed that the assistive feature requires the driver to always keep their hands on the steering wheel, Luo blamed the accident on Tesla for the false impression given to the drivers by Tesla's sales staff on the system as they strongly promoted the system as "self-driving". (Spring & Sage, 2016) Other Tesla drivers interviewed by Reuters in the same year also confirmed that sales staff took their hands off the wheel while demonstrating the function in China. (Spring & Sage, 2016)

"[T]he capability of individuals and communities to make informed choices and to act on their own behalf" has been emphasised in the human security narrative. (Commission on Human Security, 2003, p. 5) As an L2 assisted driving system, the ASDS is now achieved by human-machine cooperation. In this sense, how the smart car, a constantly upgrading machine equipped with the latest ground-breaking technology, is understood and operated by ordinary drivers is crucial to the car's safety. Unfortunately, this crucial human-car relationship has been given much less attention from a technical and operational perspective.

The critical question is how Chinese people react to the changing behaviours required by the transformation along with the overpromising messages sent by carmakers. This section by no means indicates that the maturing new technology itself does not contribute to safe driving. Some drivers, especially novice drivers, enjoy the "helping hand" offered by the new feature. Zhihu user 李应锋, an Xpeng ES8 driver based in Guangzhou, is one of them. He enjoyed functions like automatic braking, believing these functions help make his driving much safer. Systems like Tesla's Autopilot can safely bring the car to a stop when a drunk driver passes out, potentially saving lives. (Lambert, 2021) However, how this helping hand is comprehended and utilised by ordinary people constitutes the other side of the story that implies safety concerns. As noted earlier, the behavioural changes required by the new mobility tool bring ontological insecurities to people, which hinder some people from embracing it. On the other hand, another group of people follow carmakers' propaganda and decide to try out new features. Those who take autonomous driving for granted cause safety risks for both themselves and

others. The dangerous misuse of certain assistant driving features among Chinese pioneer drivers has proven the point. The next section will examine how misleading publicity information, or the lack of access to accurate and reliable information, has caused safety risks among Chinese EV early users and other road users.

9.3.4 Harm incurred by the pioneers

As noted in the earlier section, new technology attributes require behavioural changes and thus bring new safety risks. People's full awareness of these constantly emerging risks is needed for the car's safe operation. Partly due to the misleading promotion of EVs, it can be observed from the online expressions of some Chinese early adopters that their perceptions and evaluations of EVs, including benefits and potential risks of driving an EV, are embedded in an insufficient knowledge of the "capability" of the car. Some drivers tend to overtrust it and treat it as a "real" driver. The following misuse of driving assistant functions among these Chinese early adopters and the misleading information they share can be frequently spotted on Chinese social media. The ignorance of some early adopters causes safety risks to the drivers themselves and misleads others to cause more safety risks. The immature behaviours of these pioneers and the unfortunate accidents caused by their "carefree" driving style have built up a barrier among the general public as the sense of untrustworthiness of the driving assistance system has been developed. The accidents following these misbehaviours constitute a source of risk in people's perception and lead to the fact that many Chinese people still harbour doubts about the new technology's safe operation even after over five million EVs have already been sold in China.

Behaviours of treating the car as a qualified driver without paying sufficient attention to the road conditions are noted in the online experiences shared among Chinese EV users. Safety warnings regarding the driver assistance system can be found on official websites in such statements as the driver assistance system is "intended for use with a fully attentive driver, who has their hands on the wheel and is prepared to take over at any moment".[60] Ignorant of the safety warnings and requirements of human attention and intervention when necessary, some

[60] Tesla. Support. Autopilot and Full Self-Driving Capability. https://www.tesla.com/support/autopilot [Accessed 14/09/2021].

early adopters are passionate about looking for and sharing with fellow drivers alternative "solutions" to the "troublesome" requirements with some basic "cheat" devices:

> The car drives itself most of the time. If you hang a water bottle on the steering wheel, the steering wheel will think you are holding it. This way, you wouldn't need to touch it for the next hundreds of kilometres. (因为大多数时间都是车自己开自己，如果给方向盘上挂个水壶，方向盘会以为你手在按着它，这样几百公里都不需要碰一下方向盘。)

This is the experience shared by Zhihu user 家徒四壁麦克斯. [Figure 9.6][61] He was not alone. Tesla user 空旷地带 also set a dangerous example:

> Intelligent assistive driving has solved one of my sore points: long-distance driving gives me sore eyes. The Autopilot has now completely solved this problem. Once I was driving from Shenzhen to Guangzhou, my only job was to have some food and check what's happening on Weibo and WeChat (Chinese social media platforms) during the journey. This has made my long-distance driving an enjoyable long-distance trip. (在高速行驶上，智能驾驶辅助的确解决了我一个痛点问题就是我开长途汽车，时间长了眼睛疲劳会不自觉的流泪，切自动驾驶辅助就可以完全解决我这个问题，我有一次从深圳开到广州，一路上我开着车，刷刷微信和微博，吃吃东西，完全把长途驾驶改为了驾驶旅游的感觉。)

Some others, like 虎嗅蔷薇, have also shared their experience of giving the car full autonomy and passing the responsibility on to the car entirely while driving with ADAS. When other Zhihu users pointed out the bad example they set and the potential safety risks it could cause, many dismissed it, arguing that it is "no big deal at all" to drive while using the phone. All evidence above demonstrates that some early adopters do not know how to handle it properly when handed a powerful new technology and promised new driving experiences. The ignorance of potential safety risks demonstrated from the data collected proves a source of safety risk as their misjudgement endangers themselves and other road users.

[61] This figure was not shared by Zhihu user 家徒四壁麦克斯 in his post. It was adopted to illustrate his "idea" better. It was not hard to find an illustration as his idea is widely shared by fellow EV users worldwide.

Figure 9.6 https://www.youtube.com/watch?v=VSYbiTgJ7z4 [Accessed 23/10/2021]

A distinct group of people among the pioneer adopters are those with certain social influences. More fears and doubts around the safety issues of assistant driving have been played up as people with certain public influence have been involved in autonomous driving-related incidents in China. The recent death of Wenqing Lin, a 31-year-old promising entrepreneur and the founder of well-known Chinese restaurant chain brands, while driving a NIO ES8 SUV shows that well-educated people with high social status can also misuse the new functions. The noticeably increasing media coverage and public attention on incidents of this kind render autonomous driving an even more risky activity in ordinary people's minds as a reminder that the unregulated ignorance and blind trust over assistant driving are not limited to the less educated people. According to a NIO statement, the lethal crash occurred when the driver was using NIO ES8's "Navigate on Pilot" (NOP) feature. Even though the police investigation on the accident has not concluded when writing this section, it is likely to result from the driver's misjudgement and misuse of the driver-assistance system. In the accident, the car first hit a cone on the side of the road and then rear-ended a highway maintenance vehicle. No deceleration was detected during the process, indicating that the driver took no intervention measures when the accident occurred. Gao Shen, an independent analyst based in Shanghai, commented after the incident, "I would believe that in some cases, driver assistant technologies malfunctioned and caused the crashes, but some bold drivers were to blame for the accidents because they did not do what they had to do to avoid the crashes." (Ren & Liu, 2021b)

As this subject of controversy mounts worries about the safety of assisted driving among the Chinese public, there is obvious concern from industry officials and analysts that more education for drivers is necessary to help avoid tragic accidents. (Ren & Liu, 2021b) Apart from realising that more time is needed to develop next-generation autonomous driving, EV users criticise EV companies for lacking information and cautious reminders of technological limitations. It would be biased to deny the efforts made by EV makers to avoid tragedies caused by improper use of driver assistance. Some electric carmakers have noticed the chances for users to misuse autonomous features and have taken measures to improve drivers' safety awareness. [62] It is, however, necessary to note the gap between some early adopters' perceptions of the capability of machines to take over human drivers and the actual intellectual level of the driving technology. "We see that users' expectations for these technologies now are usually higher than the level of automation the intelligent cars can achieve, and it puts the users at great risk." (Ren & Liu, 2021b) Full awareness among the general public of the risks of autonomous driving has not been formed at this stage when the technology is not mature enough. It is primarily the car companies' responsibility to well educate and prepare ordinary people with accurate knowledge and appropriate attitudes before certain potentially risky features are released for them to use. As said by Cui Dongshu, secretary-general of the China Passenger Car Association (CPCA), "the car companies are responsible for telling the consumers that autonomous driving has not replaced manual driving and the driver should be able to take over control of the car at any time." (Ren & Liu, 2021a)

9.3.5 Implications for safe automobility

The introduction of new technology comes along with new safety risks. People are required to adjust their long-term driving habits in order to avoid tragedies. On the one hand, some people are put off as making changes in such daily routines as driving habits can be challenging for

[62] For example, Chinese EV startup Xpeng Motors released its latest autonomous features for highway driving in early 2021. Like Tesla's Autopilot, Xpeng's Navigation Guided Pilot (NGP) system allows its flagship P7 sedan to automatically change lanes, speed up or slow down, overtake cars, and enter and exit highways. Apart from instructional requirements such as holding the wheel while using the autonomous driving features, it is also mandatory for the driver to watch a safety video before the highway assistant driving feature can be engaged. A warning will be sent to the driver when manual controls are needed in situations such as adverse weather conditions or road accidents. (Kharpal, 2021)

people from an ontological security perspective. On the other hand, the misleading information spread by carmakers encouraged a group of early adopters to be overoptimistic, overtrusting and misusing certain new features, through which misleading information is spread among the mass public and dangerous driving behaviours are encouraged. Media coverage of accidents involving EVs, a considerable amount of which are caused by the driver's misconduct, brings more safety concerns among the Chinese public.

As demonstrated in the online observation, people do have safety concerns. The analysis conducted in this section sheds light on three possible sources of human insecurity, which may impact the acceptability of EVs among the Chinese public. The first is the technological transformation itself that requires people to adapt, which can be a challenge to the routines underpinning one's ontological security. Even though this section discusses acceptability based on the notion of existential safety, the discussion on driving safety can go beyond physical to people's perceptions. Everyday life routinisation makes security. It has an intrinsic value as it provides a stable cognitive environment. (Mitzen, 2006, p. 342) Disruptions to the daily routine can be a source of insecurity.

It is necessary to note that people are highly adaptive living in this constantly changing world, as we face the constantly advancing technology that is changing people's lives daily. "Technology adoption is an active process, with elements of innovation in itself [...] Behaviours, organisation and society have to re-arrange themselves to adopt, and adapt to, the novelty. Both the technology and social context change in a process that can be seen as co-evolution." (Rip & Kemp, 1998, p. 389). In the context of transportation transition, the "co-evolution" is required among the public with the process from the genesis to the large-scale adoption of the new technology that involves constantly unfolding security risks. It is, however, important to identify the insecure feelings changes may cause. The co-evolution can be challenging. Behavioural changes required by the transformation pose a challenge to ordinary people in the stability of their cognitive world. "Living in a world that is constantly changing, featuring the fast advancement of technology, with the constant need to find oneself, anxiety is a kind of experience surrounding everyone." (Giddens, 1991, p. 14) Since behavioural changes are required among users in this transformation, abandoning the familiar way of driving and adjusting to new habits inevitably involve a period of diminished security. (Kent, 2013, p. 232) Some people, therefore, would still prefer the traditional cars they are familiar with and would not need to face any challenges posed by disruptions to their daily routine. The desire for

continuity and avoiding changes out of people's ontological security needs may create barriers to EV adoption.

The second source of insecurity comes from the "major player" carmakers and their confusing publicity, which encourages dangerous behaviours from EV pioneers and early adopters that may cause harm to both themselves and other road users. The dangerous examples set by some early adopters constitute the third source of insecurity, as their behaviours have influenced the perceptions of the mass public regarding how safe and trustworthy EVs are. Bringing uncertainty within tolerable limits so that people feel confident that their environment can be predictably reproduced[63], that is, EVs are mature enough to meet their mobility needs in a safe manner as traditional cars are, is necessary for them to embrace the new mobility technology. The confusing information about EVs available in mass media and constant media coverage of how early EV adopters are involved in fatal car accidents, however, enlarge the uncertainty and doubts in people's minds, intensifying the sense of insecurity among the Chinese people. "Basic to a feeling of ontological security is a sense of the reliability of persons and things." (Kearns, 2000, p. 388) The confusing information provided by carmakers can be a challenge to people's autonomy, or "knowing what to do", which is a crucial component of ontological security. (Kent, 2013, p. 231) As noted in Chapter 6, homes have been portrayed as a place where people can work to attain a sense of ontological security. Cars are now promoted as new homes and becoming an increasingly important place for "dwelling", which makes it even more difficult for people to accept the uncertainties brought by the transformation.

Conclusion

This chapter discussed acceptability from two perspectives: environment and driving safety. By observing the perceptions of ordinary Chinese people in EV-related online discussions, this chapter identified a lower public interest in the environmental benefits of EV development compared with other considerations shaping EV adopting intentions such as costs, car

[63] It is important to stress that this confidence is an internal and subjective property. It is "independent of the objective level of uncertainty, which might remain high". (Mitzen, 2006, p. 346)

performance, brands, and accidents involving EVs. EV's environmental benefits do not constitute a major consideration shaping people's perceptions of adopting EVs. In contrast to the taken-for-granted idea that China's EV development contributes to environmental security in the perception of Chinese people, the Chinese government's determination to replace gasoline cars with electric ones does not make people feel more environmentally secure.

Safety, instead, has been identified in the online observation as among the core values of human security that attract the attention of the Chinese public. Safety issues of EVs have created various security concerns among the Chinese people, which can be barriers to EV adoption among the Chinese public. Technical changes brought by automobility transformation require user behavioural changes to ensure safe driving. Even though people are highly adaptive living in this constantly changing world, abandoning the familiar way of driving, and adjusting to new habits inevitably involves a period of diminished security and anxiety. Disruptions to the daily routine can be a source of insecurity. The desire for continuity and avoiding changes out of people's ontological security needs may create barriers to EV adoption. Meanwhile, carmakers have failed to keep a good balance between pushing forward the development and providing adequate safe operation guidance for ordinary drivers. The war among these competing players in car promotion has led to the spread of exaggerated, contradictory, and even false information that exaggerates the capabilities of their cars. Excessive publicity and advertising of driver assistance as autonomous driving encourage the potentially dangerous misuse of the feature by drivers. The dangerous misuse of certain assistant driving features among Chinese pioneer drivers has caused safety risks for both themselves and others. The immature behaviours of these pioneers and the unfortunate accidents caused by their "carefree" driving style have built up a barrier among the Chinese public as the sense of untrustworthiness of the driving assistance system has been developed.

All evidence provided by this chapter demonstrates that the automobility transformation is not only a process of technological advancement; it can be seen as a structural disruption affecting the automobility of the mass public that requires changes in their routine "doing". The crucial human-car relationship deserves more attention from major stakeholders, including the government, carmakers, and the mass public, especially early adopters. The next chapter will discuss in detail how these major stakeholders can be actively involved in increasing the acceptability level of EVs among the Chinese public and how the discussion will contribute to achieving a better understanding of human security.

Chapter 10 Discussion and conclusion

Introduction

This chapter will discuss major findings and bring analytical insights to the research. Based on the research gaps identified and the empirical observations discussed in earlier chapters, this chapter will summarise the key findings of this research, answer the research questions, and discuss the value and contribution of this research from both theoretical and empirical perspectives. It will also propose opportunities and directions for future research.

10.1 Summarise the research

10.1.1 Research background

This chapter aims to discuss the findings and answer the research questions. To better contextualise them, it is necessary to recap the background of conducting this research, the research gaps, the puzzle this research aimed to solve, and how it has been addressed so far. Since its introduction in the 1994 Human Development Report, human security as a widely adopted framework in analysing state-individual security relationships has been largely absent in energy security analysis despite the significance of energy in everyday life. (Karlsson-Vinkhuyzen & Jollands, 2013) Energy security provides a good lens to examine this relationship thanks to both its close connection with state-level security concerns and its essential role in everyday life of the people. To better understand the broad approach of human security through the lens of energy use and examine the implications of EV development from a human security perspective, this research has chosen China, the world's largest EV market, as a case study.

The development of the EV industry has mainly been an energy security consideration in China’s case. For the industry to achieve its strategic purposes, its sustainability cannot be

ignored. The domestic uptake, even as the world's largest EV market, has failed to achieve the original goals to the extent that the goals have been repeatedly modified. As argued in Chapter 3, the unsatisfying domestic performance can be a result of a lack of a sense of security among the Chinese people. Transportation constitutes an essential part of how individuals consume energy to meet their daily needs. People's lives will be profoundly impacted by the new option of automobility in terms of both how their utility and psychological needs are met and, more importantly, how they perceive these changes. The well-being of the Chinese people is seen as a top priority in China's security policymaking. It is constantly stressed as a determinant element of China's holistic national security strategy. The sustainable development of China's EV industry, which relates directly to the industry's role in enhancing China's national energy security, requires the embracement of EVs by ordinary Chinese people. In this sense, this research was conducted with two purposes: to contribute to the existing human security literature by enriching the broad human security approach from the perspective of human energy use and to explore what a human-centric view can tell about the sustainable development of China's EV industry.

10.1.2 Research gaps

Chapter 2 and Chapter 3 explored the gaps in the existing literature from theoretical and empirical perspectives respectively and explained the reasons and motivations for bringing together the two keywords - human security and China's EV development. Chapter 2 dealt with the first keyword, human security, and how, from a theoretical perspective, the case of China's EV development will help enrich its understanding. The chapter examined the narrow/broad debate of human security with a highlight on the limitations of the existing literature in understanding the broad approach and its analytical utility, which, together with the dominant state-centric understanding of energy security, may have explained why energy has not been much included in the human security analysis despite its irreplaceable role in people's everyday life. Chapter 2 explained why and how the case of China's EV development, a significant part of the country's energy transition and an industry of strategic importance, provides an ideal lens through which the analytical utility of the broad human security approach can be better appreciated. From a theoretical perspective, the question to answer in this research is: how does

the exploration of China's EV development contribute to the broad understanding of the human security framework?

Chapter 3 illustrated the reasons from an empirical perspective for conducting this research. It focused on the gaps in the empirical knowledge of the implications of China's EV development and how a human security perspective can help explore the gaps. The chapter examined the Chinese EV industry's strategic role in ensuring the country's energy supply by reducing its imported oil dependence and gaining an advantage in the new round of green energy competition. It also stressed the less satisfying domestic EV market performance, focusing on the private ownership of passenger EVs. Compared with the success of its EV policy on the international stage, the Chinese government has not been coping well with the development in human terms. Drawing on China's holistic national security strategy, which prioritises the security and well-being of its people, this research has illustrated why the domestic market and the ordinary people's concerns matter in achieving China's national security goals. The complicated relationship between state and human security as reflected in the case of China's EV development inspires this research to explore what this mobility transition as a national energy security strategy entails. More importantly, the significance of public embracement of the new mobility option on the sustainability of the EV development, which is essential for the industry to serve its strategic purposes, encourages an exploration of how human security considerations can contribute to the understanding of the barriers and driving forces of EV uptake in China. In this sense, the empirical motivations for conducting this research become clear: how does a human-centric perspective help advise the sustainable development of China's EV development, which is strategically important in improving China's energy security and getting ahead in the new round of energy competition?

10.1.3 Analytical framework

This research proposed an alternative analytical framework by reinterpreting the 4As framework to inform the data collection and analysis. The 4As framework is widely adopted to analyse state-level energy security issues. By changing the referent object from the state to the people, this research reinterpreted the four parameters identified in the As framework (availability, affordability, accessibility, and acceptability). It assessed the security

implications of EV development on the individual level in China's context. To complement the 4As framework and better capture the complexity of the relationship between mobility practices and people's sense of security, this research introduced the ontological security approach. It has helped in more delicate ways to depict how mobility is practised among the Chinese public and explore the subjective aspects of human security embedded in daily lives.

10.1.4 Methodology

This research explored the human security implications of China's EV development with a highlight on the subjective experiences of individuals. To achieve the goal of human security in reorienting the security policy and analysis from "high politics" to "individual everyday experiences of deprivations and insecurity" (Newman, 2021, p. 5), this research adopted the netnography method to record, understand, and analyse very personal driving forces and barriers of China's EV uptake following its data collection and analysis operations. It identified social media as a place to hear people's voices and capture the everyday experience of ordinary people. Various concerns, such as the unsatisfying driving ranges, lack of sufficient public charging infrastructures, and performance uncertainty in different weather conditions, are frequently seen in EV-related public discussions on social media. These concerns can be reasons that have kept people from accepting the government's efforts to promote EV development as an industry of strategic importance. EV development is nowadays a hotly discussed topic on Chinese social media and has attracted a lot of public attention. The primary task, which is also a significant contribution of this research, is to listen to people's voices and depict a picture of the development of the EV industry in China from the largely neglected individual's perspective.

10. 2 Answering the research questions and illustrating original contributions

Based on the summary above, this section will answer the research questions in both theoretical and empirical terms, illustrate how this research has contributed to filling the gaps identified, and lay out the value and contributions of this research.

10.2.1 How does the exploration of China's EV development contribute to the understanding of human security?

A. This research has provided more evidence for the applicability of the broad human security approach in energy security analysis by reinterpreting the 4As framework.

This research has identified what has been missing in the current understanding of the broad human security approach and provided evidence for its applicability in the broader energy scenario, the latest development of the automobile industry in the case of this research, as well as its analytical utility as a domestic policy agenda. As noted in Chapter 2, energy has been largely invisible in human security analysis despite its significance in daily life. (Karlsson-Vinkhuyzen & Jollands, 2013) Apart from the entrapment of energy policymaking within the paradigm of national security, another reason for the invisibility proposed by this research lies in the lack of a comprehensive understanding of the applicability of the broad human security approach in the existing literature. This research has provided evidence to challenge the current understanding of the UNDP approach and its limitations identified in Chapter 2, such as the special attention given to the most vulnerable in the UNDP concept. It has demonstrated that threats to human security can exist at all levels of development and touch not only the most vulnerable groups in the most vulnerable countries but also people living in well-developed regions in the face of the lasted technological transformation. The research has also shown that development, given special attention and seen as the solution to human insecurities, can generate new security risks. Along with the advancement of new technologies, new opportunities and challenges emerge, which will add to the existing list of threats. More attention should be given to the impacts of the emerging security risks caused by the latest development. The analysis of China's EV development as a significant step in the country's energy transition has contributed to developing a more comprehensive understanding of the broad human security approach. Incorporating the latest development in this human security inquiry is a reminder that what the most relevant threats are and will be at a particular time and place must be constantly asked.

While some countries such as Canada, Norway, Japan, and Switzerland have included human security considerations in their foreign policymaking, (Krause, 2007, p. 3) very few countries have adopted human security as a national policy agenda. It indicates that human security concerns act more as normative guidelines than comprehensive analytical frameworks through

which energy security in specific situations facing a specific group of people can be systematically assessed. This research has proposed to reinterpret the 4As framework in an effort to explore and provide evidence for the analytical utility of human security in domestic policymaking. Rather than merely a "slogan" or a "label", "human security was a lens, a way of describing or framing what [states, NGOs, and institutions] were doing that allowed a number of disparate policy initiatives to be linked, and to be given greater coherence." (Krause, 2007, p. 4) The reinterpretation of the four parameters and exploration of alternative interpretations of questions like security for whom, security for what value and from what threats, and security by what means of this research have provided evidence for broader understandings of what the human security framework has to offer.

B. This research has provided more evidence for new interpretations of the complicated relationship between state and individual security - human security of Chinese characteristics.

Based on the Chinese understanding of and approach to human security noted in Chapter 2 and the analysis conducted in the empirical chapters, this research proposes a different perspective in understanding the relationship between state and human security as demonstrated in China's case: ensuring human security is essential in the implementation of security strategies on the state level. This research has taken China's EV development as a case to explore how human security has been expressed in the context and provide more evidence for the understanding and reconciliation of the human security approach in China's context. Meanwhile, even though this research argues for the analytical unitality of the broad human security approach, it also recognises the implications of its conceptual ambiguity, as shown in the gaps between understanding and implementation of human security drawing evidence from China's case.

The human security framework deals with the relationship between security on the state and individual levels. The "starting point" or "the main argument" of the human security approach stands in tension or even in potential conflict with the state-centric conception of security. (Krause, 2007, p. 4) It emphasises that the state may be unable to protect its citizens at times. It can even be a threat to the security of its citizens. "[B]y shifting the referent object of "security" from that of the state to that of the individual, it highlighted the tensions that exist between promoting state security, and promoting the security of individuals, which has historically often been jeopardised by the state." (Krause, 2007, p. 4) Meanwhile, as made clear

in the UNDP approach, human security is by no means on the same level as national security. The national ownership nature of human security leads to the idea that instead of replacing state security, human security complements state security. (UNGA, 2012; CHS, 2003, p. 2)

Along with the confrontational or hierarchical interpretations of the relationship between state and individual security, China's case has proposed a different perspective that ensuring human security is essential in the implementation of security strategies on the state level. The case of China's EV development has demonstrated that people's security concerns may well stand in the way of a successful EV rollout. The sustainable development of the industry, which constitutes a strategic step for meeting China's national security goals, is less likely to happen without cooperation from the ordinary people. This is in line with Trombetta (2008) that the energy transition is only possible through growing public acceptance and technological innovation. "The problem then becomes one of promoting public acceptance and technological innovation to support an energy transition since technological innovation cannot be successful if favourable socioeconomic conditions are not in place." (Trombetta, 2008) Echoing the human security methodological idea presuming that securing individuals can better ensure the security of the state, (Tadjbakhsh, 2013, p. 49) this research, drawing on the evidence of China's EV development, argues that people having security, or feeling secure, is significant for achieving related national security goals.

The recognition of the importance of the security of individuals in achieving national security goals does not, however, necessarily translate to concrete political actions. As has been examined in the empirical chapters and will be discussed in detail in the next section, human security considerations discussed in this research have not been fully taken into account in China's EV policymaking despite the acknowledgement of their significance in China's holistic national security strategy. Other factors examined under other parameters besides affordability have not been given enough attention.

The reason for the contradiction may partly lie in how the human security approach is understood and exercised in China. One reason to explain why human security concerns are not prominent in the current EV policymaking speaks to the characterises of the Chinese human security narrative noted earlier in Chapter 2 that the human is understood as collectivity rather than individuals. Since adopting an EV is a personal choice that, as discussed earlier, may vary significantly in individual cases, it may explain why EV development is yet to be explored through the lens of human security in China. There are, however, more significant reasons.

Among them, the lack of agency is worth attention. Existing research has argued that public participation is less visible in China's EV policy implementation as "[c]itizens are mainly seen and regarded as consumers and potential buyers of new energy vehicles". (Pelkonen, 2018, p. 6) The lack of public participation may explain the low visibility of human security considerations identified in this research. This low visibility echoes the often-heard criticism of human security regarding the agency issue noted in Chapter 2: "[t]he challenge is how to interpret and apply this inspirational broad idea in practice." (Gomez et al., 2013, p. 10) Even though the approach proposes a normative emancipatory world and helps identify threats facing human beings, the power and resources needed to deal with the threats are still in the hands of the government and are used based on national interests. There is a lack of alternative agency to fulfil the vision proposed by the approach. The provider of security and how the security of individuals will be achieved are much less clear.

As noted in the discussion of human security in China section in Chapter 2, the agency is mainly in the hands of the Chinese government, which is well expected due to the authoritarian nature of the Chinese government. China's EV development has been guided by a top-down approach with the central government as the "initiator" and "main driver". (Pelkonen, 2018, p. 1) The power and resources possessed by the Chinese government make the top-down approach possible.[64] The top-down approach of China's EV development has, however, rendered the involvement of citizens rarely visible, (Pelkonen, 2018, p. 6) despite EV's close connection to the daily mobility security of ordinary Chinese people. Instead of proposing alternative ways for individuals to exercise their agency, which will be touched upon in the next section, this section would like to explain how this top-down human security approach has been justified in the Chinese society, including in Chinese academia, and in this case, why it would be difficult for ordinary Chinese people to exercise their security agency by having their voice taken into

[64] It is necessary to acknowledge the effectiveness of the top-down approach. The fact that China is the world's largest EV producer, market, and major player in the world EV-related technology and trade, as examined in Chapter 2, has proved the advantages of the top-down approach. Given its unchallenged political authority, the Chinese government is in control of vast financial, human, and intellectual capital and direct or strong influence on markets, policies, and politics. (Trencher et al., 2021, p. 1) It is able to "encourage substantial collaboration and cooperation between various government agencies, research institutes, producers, and component suppliers." (Liu & Kokko, 2013, p. 25) It is, therefore, able to "trigger widescale socio-technical change within a short timeframe due to the concentration of resources and agency". (Trencher et al., 2021, p. 1) The development of the EV industry constitutes a typical example.

consideration in the policymaking, which will help paint the picture of how human security is approached in China’ s EV context.

As noted in Chapter 2, political security plays a vital role in China’s holistic national security strategy. “Although both ‘history’ and the ‘Chinese People’ had ‘chosen’ the party to rule, its continued tenure in power could not be taken for granted.” (Breslin, 2015, p. 253) As the state is the ultimate object to protect, the emphasis on human security in China’s national security strategy can therefore be understood as a move by the Chinese government to gain people’s trust and win the governance legitimacy. “[I]t is politic to emphasise that focusing on challenges to the individual are not intended to replace the state as the referent point, but rather to suggest a rethink in how the two are (or should be) linked.” (Breslin, 2015, p. 255)

Efforts have been made by the academia in China in linking the two while reinforcing the idea that ensuring human security is essential in implementing security strategies on the state level. There is an overemphasis on the compatibility with security agency less discussed in the Chinese human security literature. “[N]either human security nor the ‘people first’ policy aims to replace the state as the key security actor, but rather seeks a balance between the state and people. (Ren & Li, 2013, p. 38) It has been reiterated by Chinese scholars that “individual security and national security in China are not inherently contradictory or mutually exclusive. They often overlap and are mutually compatible”. (Zhang & Zheng, 2013, p. 46) Described as “the two sides of the same coin”, state security and individual security are supposed to be “consistent and complement one another.” (Ren & Li, 2013, p. 38)

As a result, the tension between national security and individual security regarding security agency has been transformed from the extent of government control to the allocation of resources to promote human security by the government guided by the national interest. (Zhang & Zheng, 2013, p. 46) The security agency is therefore taken for granted, and the role of the state is solely stressed as the provider of security rather than potential threats. Newman (2021, p. 4) points out that the “central controversy” in the human security debate lies in the primary role and responsibility retained for governments, which no longer reflects the human security agenda that acknowledges states may be the primary threats to human security. This is the case

in China. “The state is thus seen as the source of human security, not in any way a challenge to it.” (Breslin, 2015, p. 249)

The state’s only role as a source of rather than a threat to security finds expression in the public response to the narrative of developing EVs as an energy security improvement strategy in China. As discussed earlier in the Dutch gasquake case, the traditional security of supply understanding of energy security has been questioned and challenged by the local population on its safety and reproduced by setting the outermost boundaries of acceptable actions and living standards. (Kester, 2017, p. 12) As a result, gas is no longer seen as a silent and bountiful resource but as a necessity to which the country is addicted. (Kester, 2017, p. 19) This is not the case in China. The motivation for promoting EVs in order to reduce China’s reliance on imported oil has not been challenged within the Chinese society. The traditional logic of energy security within the EV context still works among the Chinese people in accepting and rationalising the policy choices of the Chines government, even though the Chinese people are the ones who would have to bear any consequences.

The move to emphasise/reinvent/reposition the role of the state as the security provider serves the purpose of gaining the ruling legitimacy of the Chinese Communist Party from the Chinese people. It, however, renders the voice of Chinese people less heard and makes it more difficult for people to exercise influence on political actions, which is reflected in the analysis of this research: even though challenges facing the people are emphasised in national security considerations, the preference to stick to the state-level analysis in China’s human security discussion has hindered academic efforts like this research to bring down the referent to the individual. This feeds into the explanation of why the human security considerations identified from the real-life experiences shared by ordinary Chinese people regarding China’s EV development under the other three parameters have not been included in China’s EV policymaking.

The Chinese experience of redefining human security points to the argument that there is no fixed understanding of human security. The concept is always adapted to keep with the state’s priorities and objectives and to make it “suitable” and “safe”. (Breslin, 2015, p. 253) The ambiguity of the human security concept has been argued by the broad school as its strength rather than weakness. The lack of an agreed-upon definition can be a refusal to the dominant security agenda as it opens up the possibility of drawing attention to peripheral issues in

security studies. (Tadjbakhsh, 2013, p. 46) The ambiguity and the utility of human security of "manifesting for various purposes in various contexts" (Liotta & Owen, 2006, p. 51), however, give China the space to move away from its supposedly distinctive concentration on the individual and redefine human security to suit its political purposes, not only regarding what threats to be protected from but also whom to protect and how to protect. Even though this research argues for the analytical utility of the broad human security approach, the freedom of interpretation offered by the approach "says something about its residual analytical fuzziness". (Breslin, 2015, p. 244)

C. This research has further explored the less discussed but significant dimension of human security – the subjectivity of human security by incorporating the ontological security approach.

The online observation conducted by this research in exploring the everyday security in China's EV development context provides a chance to add to the less discussed subjective dimension of human security, which is also a theoretical contribution of this research. As a paradigm that "allows recognition of threats and vulnerabilities to the full potential of an emancipated life" (Tadjbakhsh, p. 45), the broad human security approach recognises that abstract concepts such as values, norms, and expectations matter in security analysis. (Liotta & Owen, 2006, p. 51) In order to better illustrate that security can be personal feelings rather than the prerogative of the state, or something existential, this research has introduced the concept of ontological security in the analysis of each parameter of the As framework. It informed a better understanding of what the subjective dimension of human security can tell about people's basic mobility needs in the context of automobile transformation. "Automobility's appeal is its function as ontologically securing in modern life." (Kent, 2016, p. 2) The ontological approach provides an array of angles to examine individual security experiences in an everyday context. (Kent, 2013, p. 215) Drawing on the insights from ontological security and exploring the human security implications of China's EV development through the lens of some key indicators (protection, autonomy, and social acceptance), this research has emphasised the necessity of incorporating the subjective dimension in human security analysis to capture more details, including subjective feelings and psychological factors in the everyday security experienced by the public. Compared with states, human beings hold different security perceptions, have different security needs, and face different security threats. Following the broad agenda of the human security framework, this research has explored the empowerment, doubts, frustrations,

and other security concerns of the mass public in the face of the latest development. Some forms of security such as the sense of belonging that gives people a sense of security necessary for the formation of a coherent self and the construction of a coherent life story have been identified in this research informed by the ontological security approach, which can easily be ignored due to the less visibility of the subjective dimension in the current human security narrative. After all, human security is not just about what people should be fearful of or concerned about but also their perceptions of how secure they are.

Even though this section emphasises the adjective dimension of human security, the dichotomy of material and ideational security discussed under the ontological security approach in this research also brings to the realisation that the two dimensions, the physical and psychological, cannot be separated in reaching a thorough understanding of a specific human security situation. As noted in this research, the characteristics of private car use and people's attachment to them cannot be neatly classified in utilitarian and symbolic manners. This observation is in line with the broad school argument that security should be defined and explored as both objectively tangible experiences and subjective perceptions at the micro level. These two dimensions are simultaneously perceived and practised. As shown in the availability chapter, the ontological security boosting features, which enhance people's sense of security, work in both utilitarian and psychological terms and the effects are often intertwined. Other examples are the driving behavioural changes required and the safety risks associated with the driver assistance system discussed in the acceptability chapter. They can cause physical accidents when approached improperly. At the same time, they also create psychological barriers, doubts, and a sense of insecurity among the Chinese public. The ontological security approach adopted in this research helped bring together the two parts of the dichotomy for a finer-grained picture of this human security discussion. Informed by the inseparability of the two dimensions, this research contributes to the existing human security literature by bringing more evidence for the necessity to include the less discussed subjective dimension into the human security narrative.

10.2.2 How does the human security approach advise the sustainable development of China's EV development that is of strategic importance in improving China's energy security?

This research explored the human security implications of EV development in China, which enjoys a relatively high penetration in the global automobile transformation. Defined as an industry of strategic importance in China's ambitious green technology revolution, the sustainable development of EVs serves a critical role in improving both China's energy security and national security in general against the backdrop of the changing geopolitical dynamic of energy competition. As noted in Chapter 3, unlike other energy strategies on the state level such as building oil pipelines that do not involve much in the everyday life of ordinary people, the development of EVs is closely related to meeting people's essential mobility needs. This feature of EV development, together with the strategic importance of the industry, adds a human security dimension to its role of serving national security needs. This human security research has provided insights into understanding the implications of China's EV development on its people, which cannot be explained through traditional security thinking by focusing solely on existential matters. More importantly, this research has contributed to the empirical understanding of China's sustainable EV development on the individual level, which is necessary for the industry to achieve its security goals on the state level.

Even though this research focuses on China's specific social and political context, which is significantly unique in its characters and hard to generalise in other social contexts, efforts at e-mobility transition in China are of crucial global significance. (Tyfield & Zuev, 2018, p. 259) The human security approach is situation-specific. As Liotta & Owen (2006, p. 40) pointed out, "[o]n the one hand, all security systems are not equal—or even very similar. Moreover, all such systems collectively involve codes of values, morality, religion, history, tradition, and even language. Any system that enforces human security inevitably collides with conflicting values, which are not synchronous or accepted by all individuals, states, societies, or regions." The empirical evidence and value added to the literature by this research through the "situationally-responsive identification and exploration" (Gomez et al., 2013, p. 8) should not be ignored. As the world's largest and one of the earliest EV markets, China's EV development will undoubtedly shape the mobility transition in the world.

Some China-specific phenomena captured in this research can be related to other countries. China's case points to some common issues facing EV development and provides insightful lessons to which the rest of the world could refer. For example, the possibility of a land squeeze will also be great in Europe. Only 40 per cent of European EV owners have access to private parking and wall charging (Hensley et al., 2018), bringing various concerns among European early adopters. Meanwhile, the European EV market is now also policy driven. As Daniel Yergin observes, "at least for now, the demand for electric vehicles is largely coming not from consumers, but from governments whose evolving policies are shaped by climate concerns as well as by urban pollution and congestion." (Scharf, 2020, p. 8) The human security implications of EV development as a result of regulation rather than consumer demand learnt from China's case can be referred to in other policy-driven contexts.

A. Apart from affordability, other factors matter.

Even though, as noted in the earlier section, human security implications are not taken into full account in China's EV policymaking, this human security inquiry still contributes empirically to identifying potential human security implications based on the real-life experiences of the Chinese people, which may constitute barriers to China's EV uptake.

The broad school argues that human security should be treated as a normative evaluation framework, making value judgments on whether an act is morally acceptable based on its outcomes for individuals. (Tadjbakhsh, 2013, p. 45) "It is rather a paradigm and a concept that allows recognition of threats and vulnerabilities to the full potential of an emancipated life". (Tadjbakhsh, 2013, p. 45)" The analysis conducted in this research through the lens of the reinterpreted 4As framework has proven the point. With a focus on the implications of the transformation of people's mobility experiences on their well-being, this research has demonstrated that people are concerned about not merely financial costs, namely affordability.

As noted earlier, the Chinese government has paid significant attention to improving the affordability of EVs. This research has no intention to deny the significance of factors concerning affordability. Measures feature generous financial incentives, such as tax exemptions and price subsidies, which are closely related to ordinary people. The introduction of budget EVs has also been proven a success in encouraging EV uptake. As examined in detail

in the affordability chapter, financial measures taken by the Chinese government in its EV policymaking have boosted the ontological security among groups of Chinese people and created the common impression that EVs are affordable. However, the empirical analysis also showed that financial subsidies are insufficient to attract people to the new mobility idea. This research heard people's voices and examined people's concerns from three other perspectives, namely availability, accessibility, and acceptability in order to provide a comprehensive understanding of the human security implications of the automobility transformation. This research has provided more evidence for the argument that resistance to EVs is more complex than the findings of quantitative studies have suggested. It has exposed a number of sticking points for its uptake, such as the lack of ontologically securing features of EVs compared with traditional cars due to the sensitivity of EV batteries in extreme weather and the lack of access to charging freedom. Various safety concerns among the Chinese public about EVs also contribute to the barriers to EV uptake in China. The industry's failure to gain the mass public's acceptance strongly indicates that people are not secure, or at least feeling secure with the new mobility idea.

B. More actors and agency involved in the automobility transformation – potential security agency.

There is a gap between China's current human security approach, which focuses on the role of the state as both the referent object and the security provider, which renders public participation less visible, and what the human security approach is able to offer, namely, the identification of other insecurities when the referent is brought down to the individual, as did in this research. Apart from the identification of insecurities, translating them into political actions may therefore find difficulties in China due to the top-down approach adopted in China's EV development and the overemphasis on the state's role as the dominant security provider. It is, however, important to note that the broad human security approach offers flexibility in interpreting security agency. The broadness of human security can be interpreted as the recognition, despite the dominant role of states, of other possible non-state agents who may play positive roles in facing the new human security challenges in the context of the global energy transition. Instead of assuming that the responsibility for 'action' rests only with political elites who face competing demands for their political attention and resources, the broad school argues that the security situation of the people can be complex as it goes beyond

limits to survival needs and covers menaces to welfare and dignity, which requires the coalition of approaches and actors. Even though China’ s EV development has adopted a top-down approach, the discussion of the human security considerations of this research has demonstrated that apart from the EV policymaking and implementation on the state level, other players such as carmakers also play an important role in shaping people's perceptions of how secure EVs are. The broad human security approach adopted in this research has provided evidence for the necessity of soliciting actions by more actors involved in promoting public acceptance.

a. Carmakers playing an increasingly important role

The proposal made by broad human security scholars for multiple security providers has inspired this research to examine the significant role of carmakers as security agents, in the language of human security, in keeping a good balance between pushing forward the development by investing in research and introducing new technologies and providing adequate safe operation guidance to help ordinary drivers adjust to the new mobility option. Within the larger context of the integrated development of smart cities and the deep involvement of cars in the system, car makers will play an increasingly important role and exercise more agency.[65] They are, however, drawn from the evidence provided by this research, not doing well in helping people adjust to the new driving experience. As noted earlier, their misleading effect may encourage the misconduct of the public. Carmakers are accountable for ensuring people are well aware of the risks identified in the acceptability chapter and behave accordingly. Liu & Kokko (2013, p. 23) noticed such prominent players as automobile manufacturers joining the automobile transformation and argued that the private sector plays a less significant role in China compared with other countries. The top-down approach can partly explain the less significant role of carmakers during the transition in China’s context. The analysis of this research has proved that huge human security consequences would be caused if carmakers fail to take responsibility and sacrifice driving safety for a better position in the transformation competition.

[65] One exciting example of the significant role of carmakers is the woven city now being built by Toyota in Japan. For more details, see Davis (2021).

b. Early adopters utilising security agency

Together with carmakers and other major players, the early adopters play a complementary role as security providers. As noted in the accessibility chapter, early adopters tend to be more ontologically secure. The sense of agency provided by ontological security enables and motivates them to proactively respond to uncertainties and changes. Early adopters are assumed to be able to better utilise the agency by undertaking change-making actions in the face of uncertainty, which to some extent makes them security agents in the context of automobile transformation as they affect the public perception of how secure EVs are with their behaviours. Research has shown that early adopters of EVs cast an influence on later adopters through word of mouth. (Chu et al., 2019) Chapter 7 has also identified that the misbehaviours of Chinese early adopters have caused public safety concerns and negatively impacted public acceptance of EVs. It is reasonable to presume that if EVs were correctly handled by early adopters and a more positive image of EVs was established in the early adoption stage, the safety considerations would have been less of a barrier to EV's mass adoption in China. In this sense, this research argues that early adopters have a unique role in China's EV development in influencing mobility security perceptions among the Chinese public.

Early adopters' role as security agents may also be demonstrated in how they respond to the constantly changing technical advancement and following policy changes. The analysis conducted in the accessibility chapter has shown that some of them are not as ontologically secure as presumed. Their struggles would signal to the mass public how disempowering becoming an EV user would be. Along with political and business players, early adopters emerge from technological development as a pivotal group in driving the momentum of the automobile transformation. In China's context, where domestic security plays an essential role in the authority's security strategy, the signal sent out by early adopters, who act as the bridge between the government and the mass public, in terms of their ability to adopt and adapt during the automobility transformation acts may shape the transformation process.

c. Security that requires behavioural changes of the mass public

Unlike traditional energy security considerations, the automobility transformation involves technologies that can be placed as everyday technology. EVs are mainly designed for

individual consumers in their everyday lives. The misoperation of an automobile can cause serious physical harm to both those on board and other road users. In this case, ordinary people should not only be considered as the object of protection but also as the agent with the power to influence the security implications of the new technology.

As noted in Chapter 2, this human security research focuses on the mass public rather than the most vulnerable as most human security studies do. Apart from the discussion on how the mass public can be protected, the broad understanding of security agency of the human security approach allows this research to explore the role of individuals in protecting themselves in the energy transformation. Until now, the discussion has been around improving people's sense of security to achieve the industry's sustainable development. However, the role of individuals as the security safeguard is less discussed partly due to the lack of agency.[66] As argued by Alkire (2003, p. 2), human security is "deliberately protective" as it recognises that people and communities are threatened by events "well beyond their control". This is especially the case in China's political system and its interpretation of human security examined earlier. While the security provider role of the state, sub-national, and supra-national actors is well acknowledged in human security narratives, this research argues that individuals have a role in protecting themselves. How everyday consumers handle the new technology shapes how secure the technology is.

The analysis above suggests the essential role played by early adopters in shaping ordinary people's perception of EVs and how they can utilise their agency in influencing EV technology development. It is, however, worth reiterating that the key to the ultimate success of China's green revolution, the transition of the transportation industry in the context of this research, is the embracement of the idea by the mass public and the following lifestyle transformation. After all, as noted earlier, the automobility transformation is deeply entangled in the daily lives of the mass public. In the context of transportation transition, individuals are required to cooperate and "co-evolve" with the process from the genesis to the large-scale adoption of the new technology in order to protect themselves from the constantly emerging safety risks.

As argued in Chapter 9, co-evolution can be challenging. Behavioural changes required by the transformation may pose a challenge to ordinary people in the stability of their cognitive world

[66] It has been argued by the Commission on Human Security (2003, p. 5) that "there is growing recognition of the role of people—of individuals and communities—in ensuring their own security".

and cause anxiety. Technological issues, confusion, frustrations, lack of trust, and other factors have led to the unwillingness of people to accept and embrace this prominent green technology in their lives. It is, however, also important to note that apart from the ontological security narrative that people strive to adhere to their repetitive daily routine to be ontologically secure, the autonomy to learn, develop, and create is also required for ontological security. (Kent, 2013, p. 230) "Blind commitment to routine and aversion to change are markers of insecurity." (Kent, 2013, p. 230) People are required to co-evolve in order to find a new balance. The transportation transition points to the importance of embracing behavioural changes among ordinary people to maintain a certain level of security. This argument is in line with the evolving character of being. As argued by scholars like Berenskoetter (2014, p. 268), neither the self nor the world is ever solidified but is constantly unfolding. They are mutually constituted in the process. Constant re-grounding and adjustment are thus needed for both the self and the world in response to events, past actions, and future visions. (Flockhart, 2016, p. 805)

Protecting human security "with the kind of force and effectiveness that characterises responses to national security threats" (Alkire, 2003, p. 3) in the context of the automobility transformation would prove difficult. Alternative means involving ordinary people are needed in responding to new forms of insecurity following the transformation. Since more drastic changes are expected in our everyday routines, the maintenance of ontological security is a more complex project than it ever used to be. (Kent, 2015, p. 2) The behavioural changes required in this security narrative as the alternative means of security become increasingly relevant and need more detailed examination as we face increasingly urgent calls for technological transformation and the "background of being" constantly changes. (Thrift, 2005, p. 464)

10.3 Potential future research

One purpose of this research is to explore the analytical utility of the human security framework in a broad sense to cover considerations revolving around the latest socio-technical development. The EV industry is constantly evolving, which indicates that more human security concerns are emerging. It is impossible to cover all potential human security considerations in this research due to, on the one hand, time and resource limits and, on the

other hand, the fast-evolving nature of the industry. Some interesting and exciting topics that are either not directly related to the aims of this research or still emerging so that more evidence is needed stand out and are worth more academic attention in future research.

10.3.1 The New Triad

One future direction is to see the transformation in the bigger picture: the convergence of the electric car, ride-hailing and car-sharing services, and self-driving autonomous vehicles. (Scharf, 2020, p. 8) This emerging "New Triad" is believed to transform the automobile industry's stakeholders. "The world of autos - and their fuel suppliers - has become the arena for a new kind of competition… It is no longer just about selling cars to consumers for personal use. No longer just automakers versus automakers, no longer gasoline brands versus gasoline brands. It has become multi-dimensional. Gasoline-powered cars versus electric cars. Personal ownership of cars versus mobility services. And people-operated cars versus robotic driverless cars." (Scharf, 2020, p. 8) New players will get involved in the game. The human security discussion will be more complicated.

Apart from the bigger picture, specific technological development, such as Fuel Cell Vehicles (FCVs) that has been identified as the long-term goal of China's new energy vehicle development (Zheng et al., 2012, p. 20) and the Vehicle to grid (V2G) intelligent transportation system[67] that allows people to have more agency as EVs would operate as energy storage devices and may help develop solutions to overcome challenges such as the ones related to EV charging. However, at the same time, there will be new challenges, which deserve continuous attention.

10.3.2 Equality issues

An important dimension of human security is equality. EV development might deepen the inequality between certain groups in certain areas. The enlarged inequality causes concerns for both those "entitled" and those not. EV access barriers in China have been discussed in detail in the accessibility chapter. Those who are deprived of the ability to adopt EVs due to financial

[67] The system has already seen pilot projects in 15 provinces in China.

reasons or other limits are deprived of other related “benefits” enjoyed by those entitled, such as free parking and road tax reduction. This will make the privileged more privileged and the vulnerable more vulnerable. Future research can further explore how inequality has been caused and enlarged during this transition period and what inequality means for different groups of people and their security in broad emancipatory terms. After all, the mobility transition requires the acceptance and embracement of the mass population. A primary goal of the EV policy is to ensure EVs are appealing options for potential car buyers, especially those not privileged.

10.3.3 Gender issues

Among all forms of inequalities linked to cars, gender is given less attention. Inner combustion cars have been constructed as masculine. Female drivers have always been a minority in the drivers' group. In contrast, EVs have been depicted as women's transportation. China’ s case has shown that car designing has been given more space with the resurrection of EVs to interrupt the convention and rethink the gender connotation of cars and make them designed for both men and women. As noted earlier, some EV models are dedicated to female users in China. This phenomenon may not be a direct result of car electrification. Still, it represents a trend in the EV era that the mobility needs of women will be given more attention, and the gender connotation associated with cars will be more balanced. In this sense, future research can further explore gender factors, which will constitute an interesting topic in exploring the human security implications of EV development.

Conclusion

The current transition in the mobility industry is still at an early stage. However, governments are showing determination by making aggressive policies and setting deadlines to ban fossil fuel-burning vehicle sales. (IEA, 2021) The transition has already impacted many people’s mobility security and experiences, and these impacts will get stronger as EVs reach more people. However, these impacts have not been given enough attention so far. Technological

advancement is crucial but not the panacea for our energy issues. The direction of technology development needs to be informed by people's reactions and responses.

Besides analysing security, this research, in the language of the Copenhagen School, is also interested in performing the security move and highlighting insecurities on behalf of other individuals. "With the 'security analyst'…and the securitising actor being one and the same person, the human security proponent can–occasionally–influence select securitisation processes in a deliberate and thought-out fashion, to a desired effect." (Floyd, 2007, p. 45) By securitising China's EV development with a human-centric approach and engaging with the real-life experience of ordinary Chinese people, this research has made an effort to humanise the stories of the automobile transformation. Through the lens of ontological security, this research has identified confusion, frustrations, lack of trust, and other factors experienced by the people in the automobility transformation. This research argues that greater attention is needed in energy research in the context of everyday security. For many people, automobility supports the things that matter in modern life, including family and work. (Kent, 2016, p. 11) As a missing part of the energy security puzzle, human security during the energy transition period is important in informing and transforming people's relations with the transition. The discussion of this research has provided more evidence for public debate and paved the way for further human security discussions in other related areas during the energy transition.

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