ATTITUDES TOWARDS UTILIZING THE OCEANS IN CONTEMPORARY CHINESE SOCIETY

Gaining insights for sustainable human use of the oceans

Mo Chen

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Mo Chen

Supervisors

Prof. Dr. Pim Martens

Prof. Dr. Marc Davidson

Assessment Committee

Prof. dr. Anja Krumeich (Chair)

Prof. dr. Marie-Jose Enders (Open University of the Netherlands)

Dr. Jessica Mesman

Prof. dr. Henrik von Wehrden (Leuphana University Lüneburg, Germany)

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Chapter 1

Introduction

1.1 Human dependency on the oceans

If one is looking for the biggest ocean predator living on this planet, an online search will mostly likely offer the killer whale (Orcinus orca) as an answer. An adult killer whale can eat up to 136 kg of food a day (Kristensen, 2018). Although killer whales may be the biggest *individual* ocean predators, humans consumed more than 156 million tonnes and captured over 96 million tonnes fishery products per year (FAO, 2020). Presently, two-third of the marine environment has been severely altered by human activities (IPBES, 2019). As a *species*, humans thus clearly ought to have been called "the biggest ocean predator living on this planet" instead of killer whales.

It is not only for food that humans are highly dependent on the Earth's oceans. First of all, the oceans support the life of all the living creatures on land. The oceans are responsible for over 50% of oxygen production on earth, much more than the Amazon Rainforest, and absorbs 50 times more carbon dioxide than the atmosphere (NOAA, 2021). Following that, the oceans regulate earth climate and serves as a key player in several biogeochemistry cycles in the earth ecosystem. The oceans store and transfer huge amount of heat and carbon dioxide, consequently affecting nutrients and atmospheric circulations. By transporting heat and water into different corners of the earth, the oceans directly regulate weather patterns and certain climate effects. In addition, the oceans are the home to an abundance of life and resources. Life below water are of vital importance because not only their values on food supply and medical usages to the mankind but also their significant role in world biodiversity. Finally, sea beds harbor resources like oil, gas, minerals. Over 3.1 billion people rely on fish for more than 20% of their daily protein intake, with certain low food security regions reliant on fish for at least 50% (Quaas et al., 2016). Marine fisheries directly or indirectly employ at least 200 million people (FAO, 2020). As fossil fuel consumption still accounts for 80% of global energy use presently (Abas et al., 2015), offshore oil and gas drilling remain indispensable.

1.2 Present human use of the oceans is unsustainable

Although human well-being is highly dependent on the Earth's oceans, the oceans are under threat. Marine biodiversity loss is at an unprecedented rate and its main causes are overfishing, pollution and climate change (Hutchings & Reynolds, 2004; Luypaert et al., 2020). According to the Food and Agriculture Organization of the United Nation, global fish production has reached about 179 million tonnes in the year of 2018 and an estimation of 4.6 millions fishing vessels sailed across the world in this year (FAO, 2020). As a result, the abundance of marine fishes had decreased 38% from 1970 to 2007 (Hutchings et al., 2010), and 93.8% of the world's marine fish stocks are classified as "overfished" or "maximally sustainably fished" at the moment (FAO, 2020).

Apart from overfishing, humans are polluting and degrading the oceans. Several types of marine pollution are especially acute and urgent. The first one is marine plastic pollution. Plastic pollution is already ubiquitous in the marine environment, even found in the Mariana Trench, and still growing exponentially (Tekman et al., 2022). Each year there is an estimated of 12.7 million metric tons of plastic entering into the oceans and the amount of accumulated plastic in the oceans is upward of 150 million metric tons (Ocean Conservancy, 2015; Tramoy et al., 2019). These plastics can break into microplastic and nanoplastic particles and enter into marine fish, posting enormous threat to marine life and human health.

Oil and chemical spills are also seriously damaging marine ecosystem. The spilled oil and chemicals, petroleum-based pollutants, and clean-up materials can kill marine flora and fauna, destroy their living habitats, and in turn, jeopardize human health. The long time impacts in marine ecosystem still remain unclear. Taking the Gulf of Mexico Oil Spill (2010) as an example: this environmental disaster resulted in an oil leakage of 3.19 million barrels of oil, a contaminated area of more than 2,100 km shoreline and over 112,000 km^2 of ocean surface, and harmed or killed around 82,000 sea birds as well as 26,000 marine mammals (Beyer et al., 2016; Nelson et al., 2014). Even 10 years after the disaster, some dolphins and whales are still suffering from higher morality and health issues caused by the spill (Meiners, 2020).

Climate change is another reason why marine environment is in peril. Climate change can give rise to a series of environmental problems, such as ocean warming, ocean acidification, ocean deoxygenation, and sea-level rising. In fact, most of these problems are now taking place: surface temperature of the oceans has increased around 0.64 °C on a global scale over the past 50 years; sea water pH level has dropped 0.1 unit since the beginning of the industrial revolution (Reid et al., 2009). Ocean species are found to be more vulnerable to warm temperature and their extinctions are at twice the rate of land animals (Pinsky et al., 2019). Due to global warming and the aforementioned pressures, global coverage of living coral reef has decreased by half in the time range of 1957 to 2007 (Eddy et al., 2021). A decline of 49% in 5,829 populations of 1,234 marine mammals, birds, reptile and fish species took place between 1970 and 2012 (WWF, 2015).

Over the past decades, the world community has set different agendas and programs to protect the Earth's oceans. Various goals, such as the 14th Sustainable Development Goal (SDG): Life below water (United Nations, 2015), has been formulated to deal with current sustainability challenges. The objective of this SDG is to conserve and sustainably use the oceans, seas and marine resources for sustainable development, including reducing marine pollution, protecting marine and coastal ecosystem, regulating and ending overfishing, promoting sustainable management of fishery, and so forth (United Nations, 2015). The UNEP Regional Seas Programme is another lasting effort from United Nations for the conservation of marine and coastal ecosystem. Its key themes include marine pollution prevention, climate change and oceans, maritime resource management (Oral, 2015). In addition, the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) was

created in 1995 to address marine pollution resulted from human activity such as the dumping of sewage, heavy metals, and radioactive substances. Different documents and actions from global level indicate that sustainable ocean use is not equivalent to no ocean use. Sustainable human use of the oceans acknowledges the necessity and legitimacy of human needs to marine resources while emphasizing on the boundaries of human exploitation and utilization of marine resources.

1.3 Knowledge from the social sciences is crucial

Human behavior originates from human attitudes (Gifford & Sussman, 2012). To grasp the origins of the present unsustainable use of the Earth's oceans and to develop effective governmental policy, understanding present human attitudes towards and perceptions of the oceans is critical. Over the past decades, the academic world has gained some visions regarding public attitudes towards marine life and offshore oil and gas drilling. Social scientists have discovered that the public are generally aware of the significance of marine life protection and hold concern towards the using of marine life (Dimopoulos & Pantis, 2003; Freeman & Kellert, 1994; Kellert, 1999), but a utilitarian inclination of marine animal using still shows up in this social perception (Barney et al., 2005). When analyzing what are the driving factors that shaped such attitudes, basic human demographics, such as gender (Halkos & Matsiori, 2017; Kidd & Kidd, 1998), age (Kidd & Kidd, 1998), education (Braga & Schiavetti, 2013a; Hayes et al., 2015), occupation (Hoehn & Thapa, 2009), residential area (Arnold, 2004; Kellert, 1999), social economic status (Halkos & Matsiori, 2017), are uncovered to be correlated with public attitudes towards marine life. Certain behavior and personal preference, for example companion animal caretakers (Kidd & Kidd, 1997) hands-on activities (Lee et al., 2016), and aquarium visiting experience (Friedrich et al., 2014), are also uncovered to be indicators of desirable attitudes towards marine life. Beside demographics and behavior, some researchers also try to explain human perception of marine life from the perspective of environmental attitudes. Concerns for the environment is found out to be positively correlated with valuing marine life (Friedrich et al., 2014; Gkargkavouzi et al., 2019; Halkos & Matsiori, 2017). Especially, the continual occurrences of environmental disasters and pollution, such as chemical and sewage pollution and oil spills, further aggravate concerns for marine life protection (Howard & Parsons, 2006; Luksenburg & Parsons, 2014). Moreover, some environment-related activities, like doing beach sports and participation in environmental groups, are also predictors of friendly attitude towards marine life (Kellert, 1999).

Of particular interest is the case of offshore drilling, given its substantial impact on ocean life. Studies on offshore drilling attitudes mainly centers on one issue: the safety of exploiting offshore resources. A high risk perception is observed by scientific studies into different countries as well as different occupations (Michaud et al., 2008; Mullet et al., 1998; Ruiz et al., 2018). People are mostly concerned about the pollution to marine environment, the

possibilities of large-scale environmental crisis, and the health threats to local inhabitants (Eiser et al., 1988; Lilley & Firestone, 2013; Michaud et al., 2008). Undoubtedly, some of the perceived risks are not scientifically founded (Michaud et al., 2008) but still serve as clear indications of public concerns over offshore oil and gas drilling. Due to the high risk perception, what information is trustworthy becomes a serious issue. Researchers have discovered that U.S. citizens tend to believe offshore drilling is more risky than safe, corresponding to the high risk perception by the public (Carlisle et al., 2010). Public support to offshore oil and gas drilling differs on time and location. Taking the United States as an example, U.S. citizens are generally pro offshore oil and gas drilling, while in some areas such as the Californian coast, and the period after the occurrence of large scale environmental disasters, like Macondo Disaster, low acceptance rates are more often the case (Freudenburg & Gramling, 1993; Lilley & Firestone, 2013; Mukherjee & Rahman, 2016).

1.4 Context of research: Coastal Chinese society

To date, however, little is known regarding the public attitudes of Global South countries. Most of the scientific research looks into human attitudes towards the oceans in the Global North, such as the USA, the UK, and the Scandinavian countries. Considering the Global South represents nearly 80% of current world population (Solarz & Wojtaszczyk, 2015), a big part of human attitudes towards the oceans remains unknown to the scientific community. Describing human perception of the oceans or achieving sustainable ocean use in contemporary world is impossible without solid evidence from Global South countries. As the largest developing and most populated country in the world (until 2022), comprehensive understanding of public attitudes in contemporary Chinese society is in particular indispensable in the academic debate of sustainable human use of the oceans.

China is conventionally considered as an inland country for the reason that agriculture production shaped traditional Chinese culture and ancient Chinese society (Huang, 2018). It is easily overlooked, nonetheless, that China is also a coastal country with a strong and steadily developing coastal society. Geographically, China has a coastline of 32,000 kilometers, sea areas of circa 4.73 million square kilometers, and 6500 islands in varying sizes (Liu, 2013). As Figure 1 shows, a big part of Chinese territory is near the sea. Looking at the population distribution, the magnitude of coastal society becomes more straightforward. Approximately 94% of its population lives in 43% of its land and southeast (mostly coastal) China is radically more populated than northwest China (Chen et al., 2016). Population in coastal provincial regions (Liaoning, Hebei, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Guangxi, Hainan) accounts for 45% of total population in China, and this share is still growing (Chen et al., 2016; National Bureau of Statistics, 2021). Taking into account China's 1.4 billion total population, Chinese coastal society is undoubtedly impressive.

Figure 1.1 Coastal Provinces of China

Being the largest exporter and second-largest importer in the world[1], China has deeply involved itself in global trade. Marine shipping, ferry ports, coastal cities are essential factors in international business. More than 90 percent of China's imports and exports are shipped by the sea (Gao & Lu, 2019) and 60 percent of national Gross Domestic Product (GDP) is contributed by coastal provincial areas (Fang et al., 2020). In addition to the national GDP contribution, coastal areas have developed booming ocean-related industries in recent decades. Statistics from official media suggest that China's gross ocean product (GOP) in 2021 is about 1.41 trillion US dollars, accounting for 8 percent of the country's GDP expansion (Huaxia, 2022). China has been the world largest fishery producer since 2002, with both its marine captures and mariculture staying at the top places (FAO, 2020). From 2001 to 2019, the added value of China's marine tourism in coastal areas increased from ¥107.2 ($15.9) billion to ¥1808.6 ($267.9) billion, marine transport industry from ¥131.61 ($19.5) billion to ¥624.7 ($92.5) billion, and marine biomedical industry from ¥570 ($84.4) million to ¥44.3 ($6.6) billion (Kedong et al., 2021).

[1] See World Bank data 2020, on Exports of goods and services (current US$) https://data.worldbank.org/indicator/NE.EXP.GNFS.CD ; and Imports of goods and services (current US$) https://data.worldbank.org/indicator/NE.IMP.GNFS.CD

However, China's coastal society is also confronted with multiple sustainability challenges as many other countries. For thousands of years, coastal China has been suffering from environmental disasters which often lead to serious damages to the coastal economy and livelihood. This includes but is not limited to natural disasters, such as typhoons, storm surges, tsunamis, and man-made disasters, like oil spills and shipwrecks. Only in 2019, various natural disasters at the Chinese coasts caused a direct economic loss of ¥11.7 ($1.7) billion and 22 deaths (Ministry of Natural Resources, 2020). Against the background of global warming, sea level rise is another severe sustainability challenge for coastal Chinese society. The average rate of sea level rise in coastal China was 3.4 millimeter per year from 1980 to 2020 (more than the global average rate at the same time) and another 55-170 millimeters' rise is expected in the next 30 years at the Chinese coasts (Ministry of Natural Resources, 2021). Comparing to the maritime disasters and sea level rise, marine resource depletion appears to be more urgent in contemporary China. In recent decades, the depletion of fishery resource became notably prominent. The decline of wild marine fishery resources can be traced to the late 1970s (Su et al., 2020; Zhang & Wu, 2017). Up till 2010, approximately 57% of fish stocks in Coastal China had been overexploited or collapsed (Cao et al., 2017). Inshore fishing has been hit the hardest, 72.5% species of fishery resources had disappeared in the coastal waters of Shandong province until 2014 (Xinhuanet, 2014). So far, the exploitation of offshore oil and gas resources is less a problem than fishery depletion in coastal China. This is partly owing to the fact that coal, rather than oil or gas, constitutes the lion share of energy consumption in China (National Bureau of Statistics, 2021), partly due to abundant offshore oil and gas resources that lie in China's territorial waters and offshore exploration keeps proving new oil and gas fields during the past decades (Weilin et al., 2016; Yuhong, 2021). However, offshore oil and gas drilling can post great threats to the ocean environment and coastal society. A large-scale offshore oil spill event happened in Bohai Bay in 2011 which seriously polluted 840 square kilometers clean water and caused ¥1.24 ($0.18) billion fishery loss in simply one affected coastal city (Pan et al., 2015). Besides, coastal China is also dealing with other sustainability challenges like marine litter pollution, coastal wetland degradation and sea water contamination.

1.5 Research aim and research questions

This dissertation endeavors to fill in the scientific knowledge gap how coastal Chinese perceive their utilization of the oceans. To be more precise, this dissertation aims at answering how to achieve sustainable human use of the oceans in contemporary coastal Chinese society through investigating public attitudes towards the oceans and maritime issues. By means of analyzing human attitudes towards marine life, offshore oil and gas drilling, and associating these public attitudes with cultural and historical contexts in China, this dissertation intends to contribute to the discussion of how sustainable ocean use can be possible in coastal Chinese society. The central questions of this dissertation are:

a. How do people in coastal Chinese society understand marine life and marine life protection? And what are the influential factors that shaped such public attitudes?
b. How do people in coastal Chinese society understand offshore oil and gas drilling? Especially, how much support do people show to offshore drilling? How much threats people perceive associated with offshore drilling? How much trust people have in offshore drilling?
c. What are the cultural and historical origins of Chinese attitudes towards marine life and offshore oil and gas drilling in coastal Chinese society?

1.6 Methodology

This research targets at investigating sustainable human use of the oceans through examining public attitudes towards marine life and offshore oil and gas drilling. In order to fulfill its task, in-depth analysis of coastal Chinese society from manifold perspectives and multi-disciplinary knowledge on sustainability science, anthrozoology, sociology, coastal management, culture and history are needed. In that sense, integrated assessment can be a suitable research means and help to achieve the goals of this research. Integrated assessment is a comprehensive and interdisciplinary research approach combining knowledge from multiple scientific fields to facilitate a better understanding of complicated situations (De Ridder et al., 2010; Offermans, 2012; Rotmans & Van Asselt, 2002). The advantages of applying integrated assessment to research sustainable human use of the oceans are multi-dimensional: it allows the investigation of public attitudes towards the oceans from ethical, economic, and ecological perspectives; it links human attitudes to the broad context of social, cultural, and historical backgrounds; it leaves room for sustainable ocean use entering into political discussions and policy-making process; and it offers space for social science topics (sociology, psychology, political science) to contribute to solving sophisticated sustainability problems. That said, the biggest benefit of applying integrated assessment lies in the flexibility of utilizing diverse research tools (Offermans, 2012). A holistic description and analysis of coastal Chinese society are thus well guaranteed. Integrated assessment of sustainable human use of the oceans in coastal China was completed through two steps which addressed public attitudes towards the oceans and the cultural and historical roots of such attitudes respectively.

For public attitudes towards marine life and offshore oil and gas drilling, a survey was carried out in coastal Chinese society to collect data from September 17th to October 8th, 2018. Twenty-two mainland coastal cities were selected as the study sites for this investigation: Dalian, Yingkou, Qinhuangdao, Tianjin, Yantai, Weihai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Xiamen, Shantou, Guangzhou, Shenzhen, Zhuhai, Zhanjiang, Beihai, Haikou and Sanya. The online survey was conducted under protocols approved by Maastricht University's Ethical Review Committee Inner City faculties (reference code ERCIC-238-26-02-2021). The questionnaire used in this survey includes several well-constructed and universally-

acknowledged scales, such as the Animal Attitude Scale (Herzog Jr et al., 1991), the Ethical Position Questions (Forsyth, 1980), and the New Ecological Paradigm (Dunlap et al., 2000). Researchers opt to these scales in that not only their credibility and validity in measuring animal attitude, moral philosophy, and environmental values are scientifically proven, but also their design and structures already link to cultural and social settings and thus leave space for integrated assessment. Attitudinal differences on marine life and offshore oil and gas drilling were captured and calculated by SPSS. A number of statistical tests, both parametric and non-parametric tests, and an exceedance probability (p value) of no more than 5% ($p \leq .05$) were employed for testifying.

For the cultural and historical origins of Chinese attitudes towards the oceans, a grounded theory method was adopted to assess and evaluate in a broader social context. A grounded theory method usually suits a new research area with no or minimum existing literature and encourages to develop an insight in social phenomena under complex settings (Engward, 2013). Therefore, it offers a good fit for this study. The exploration of cultural and historical origins was based on results from the aforementioned ocean attitude survey as well as some earlier studies regarding human-animal relationships in contemporary Chinese society, such as Su and Martens (2017). Researchers first go through all the materials without any pre-assumptions. Keeping an open mind and letting the empirical materials speak for themselves. Coding was conducted in an iterative way and similar codes were sorted into the same category. After coding, the conceptualization of historical and cultural origins was based on the commonalities of different codes and categories. Via this procedure, a more comprehensive story can grow out of fragmented information and abstract notions can build upon tangible facts. Together with survey, grounded theory helped complete the integrated assessment of sustainable human use of the oceans in coastal Chinese society.

1.7 Outline of the dissertation

This dissertation delves into coastal Chinese society to investigate sustainable ocean use, with a focus on public attitudes towards marine life and offshore oil and gas drilling. The purpose also incorporates gaining insights in fields where as yet little scientific light has been shed upon, such as depicting a general image regarding how the coastal Chinese understand marine life and offshore oil and gas drilling, analyzing what are the influential factors that shaped such public attitudes, and finding their origins in Chinese history and traditional culture. The following four chapters offer answers to our research questions and offer insights for achieving sustainable human use of the oceans in contemporary China.

After the introductory chapter, the second chapter provides empirical evidence on how the coastal Chinese understand marine life and different usages of marine life. Special attention is given to the usage themes of food, medical research, hunting/fishing, skin/fur, and slaughter. Discovering some demographical differences on how people view marine life is also one of the

major tasks of this chapter. Going further than describing attitudinal differences, this chapter also associates marine life attitudes with personal ethical orientations. From the perspective of morality, this chapter explains why certain attitudes towards marine life using show up.

As the second chapter already portrayed a general picture of Chinese attitudes towards marine life, the third chapter lays emphasize on a different perspective to interpret such attitudes: the environmental values. It starts with an inspection of how coastal citizens position themselves within the broader environmental context. People were categorized into different environmental concern groups. Subsequently, this chapter goes on testing if such environmental values can influence their understandings of marine life protection in coastal China. Combined with the previous chapter, this chapter enriches the analysis of why the public perceive marine life differently in coastal Chinese society.

The fourth chapter reports findings regarding public attitudes towards offshore oil and gas drilling in coastal Chinese society. Marine energy resources are the key topic in this chapter. Public attitudes towards offshore oil and gas drilling will be assessed through the support people give to offshore oil and gas drilling, the risks people perceived associated with offshore oil and gas drilling, and the trust people have in different offshore drilling information. It is also worth noting that this chapter pays special attention to the impact from so-called “NIMBYism” (not-in-my-back-yard) on public attitudes.

The fifth chapter shifts the focus from public attitudes to the social-cultural context in Chinese society. Given that former chapters have illustrated Chinese attitudes towards marine life and offshore drilling and explained the underlying predictors, this chapter intends to dig deeper to uncover the societal roots of public attitudes. The societal roots are conceptualized from two aspects: historical roots and cultural roots. Evaluation were conducted on the basis of agriculture-grounded ancient Chinese society and Confucianism-centered traditional Chinese culture.

The sixth chapter closes this dissertation with a general discussion on human use of the oceans in coastal China. In view of the research questions, this chapter offers answers regarding how to reach sustainable ocean use in contemporary Chinese society. Insights on sustainable human use of the oceans are established on the whole dissertation (chapter two to five). Scientific and social contributions of this research will be outlined in this section. In addition to that, this chapter will reflect on the limitations of this research and list potential directions for future research.

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Chapter 2

Ethical Ideology and Public Attitudes towards Marine Life in China

Abstract
This chapter investigates public attitudes in Chinese society towards marine life and determines the roles of basic demographics and ethical ideology in shaping these attitudes. An online survey was conducted in 22 mainland coastal cities on the basis of a questionnaire regarding demographical information, the Ethical Position Questionnaire (EPQ), and an adapted marine life version Animal Attitude Scale (AAS). Results demonstrate that Chinese women are more concerned about marine life protection than men. Ethical idealism has positive effects while ethical relativism has negative effects on public attitudes towards marine life. Chinese citizens consider using marine life for food as acceptable, but less acceptable to use their skin or fur. Moreover, ethical ideology is found to have no influence upon public attitudes towards using marine life in medical experiments.

Keywords
marine life; public attitudes; ethical ideology; gender difference; China

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2.1 Introduction

Human behavior towards the non-human world originates in human attitudes. Understanding human attitudes has therefore been recognized as pivotal to facilitate healthy interactions between the human and non-human world so as to deal with issues such as biodiversity loss, wildlife conservation and animal welfare (Gkargkavouzi et al., 2019; Su & Martens, 2017). To foster sustainable development, an increasing body of research is therefore evolving, on public attitudes towards nonhuman animals (Martens et al., 2016). Scholars have established a relation between animal attitudes and human demographics such as gender (Pifer et al., 1994; Su & Martens, 2018), age (Kavanagh et al., 2013; Kellert, 1999), social-economic status (Taylor & Signal, 2006), educational background (Ascione & Weber, 1996; Furnham et al., 2003), companion animal ownership (Driscoll, 1992; Martens et al., 2016), religion (Driscoll, 1992; Gilhus, 2006) as well as geographic region (Phillips et al., 2012; Pifer et al., 1994). Social scientists are also increasingly linking public attitudes towards animals with moral positions (Galvin & Herzog, 1992; Taylor & Signal, 2005; Wuensch et al., 2002).

As marine life is under increasing pressure (McCauley et al., 2015), growing scientific attention has been drawn to this area. Some studies have focused on specific species, such as sharks (Lee et al., 2016; Neff & Yang, 2013), sea turtles (Braga & Schiavetti, 2013b; Dimopoulos & Pantis, 2003) and dolphins (Barney et al., 2005), while other studies looked into marine life in its entirety (Arnold, 2004; Giglio et al., 2015). Only a few studies have shed light on the demographic factors that influence public attitudes towards marine life. Researchers found that public awareness of marine life is related to factors such as gender (Halkos & Matsiori, 2017; Kidd & Kidd, 1998), age (Kidd & Kidd, 1998), education (Braga & Schiavetti, 2013b; Hayes et al., 2015), work occupation (Hoehn & Thapa, 2009), residential location (Arnold, 2004; Kellert, 1999), socioeconomic characteristics (Halkos & Matsiori, 2017) and companion animal ownership (Kidd & Kidd, 1997). Most studies have been restricted to the geographical locations of South and North America (Hoehn & Thapa, 2009; Kidd & Kidd, 1997), Europe (Freeman et al., 2012; Gkargkavouzi et al., 2019; Halkos & Matsiori, 2017), and African countries (Neff & Yang, 2013). Only a limited number of studies have been performed for Eastern Asian countries, however.

Given that so far no studies have been performed on the relationship between ethical ideology and public attitudes towards marine life, and that very few have been performed on public attitudes towards marine life in Eastern Asian countries, this study aims to fill that knowledge gap. In particular, this study investigates public attitudes in Chinese society towards marine life and determines the roles of basic human demographics and ethical ideology in shaping this attitude. An online survey was conducted in 22 mainland coastal cities on the basis of a questionnaire regarding demographical information, the Ethical Position Questionnaire (EPQ), and an adapted marine life version Animal Attitude Scale (AAS).

2.2 Methods

2.2.1 Study Areas

We chose 22 mainland coastal cities (administrative areas that include both urban and surrounding rural areas) for probing public attitudes towards marine life in contemporary Chinese society. The main reason for concentrating solely on coastal cities is two-fold: first, citizens in coastal cities are expected to be more familiar with the sea and therefore have better articulated opinions than people living in other regions (Arnold, 2004; Halkos & Matsiori, 2017). Second, a wide variety of former marine life perception studies have been performed for seaside areas (Barney et al., 2005; Neff & Yang, 2013), facilitating comparison. The 22 mainland coastal cities are: Dalian, Yingkou, Qinhuangdao, Tianjin, Yantai, Weihai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Xiamen, Shantou, Guangzhou, Shenzhen, Zhuhai, Zhanjiang, Beihai, Haikou and Sanya. These cities are all located geographically off the coast, hold well-conditioned harbors, and are well suitable for overseas trade and communication. These advantages make them perfect locations for investigating Chinese maritime attitudes. Together, residents in these 22 coastal cities offer a good representation of contemporary Chinese society.

2.2.2 Measures

The online survey was conducted in the target cities from September 17th to October 8th 2018, and consists of three parts.

In the first part, we requested only demographical information, such as age, gender, city, residential area, educational background, occupation, social economic status, and religious beliefs. Moreover, questions were included regarding living habits such as dietary preference, aquarium and beach visiting frequency.

In the second part, we used the Ethical Position Questionnaire (EPQ) to gauge personal moral ideology. Many studies have made use of the EPQ, first developed by Forsyth (1980), to distinguish between different ethical ideologies. This questionnaire helps to position different ethical opinions relative to two dimensions: *relativism* and *idealism*. Relativism stands for the degree to which individuals question universal moral principles exist; idealism stands for the degree to which individuals believe that following moral rules lead to the right consequences (Forsyth, 1992; Forsyth & Pope, 1984). A high score for relativism represents the rejection of universal moral principles, while for idealism it signifies a belief that ethical behavior always leads to good results (Galvin & Herzog, 1992). The EPQ is a 20-item Likert scale rated from 1 to 9, indicating attitudes from “completely disagree” to “completely agree” (Forsyth & Pope, 1984). Participants were asked to self-report how much they approved or disapproved with the statements. Mean scores from idealism and relativism serve as two cut-off values to classify

citizens into four ethical groups: situationists (high idealism and high relativism), absolutists (high idealism and low relativism), subjectivists (low idealism and high relativism), and exceptionists (low idealism and low relativism) (Su & Martens, 2017). The efficacy of the EPQ has been authenticated in various countries (Cui et al., 2005). The EPQ therefore enables us to test whether differences in ethical ideologies contribute to differences in attitudes towards marine life.

In the third part, we used an adopted and revised Animal Attitude Scale (AAS); one of the most frequently applied scales in the field of human-nonhuman relationship studies. Its psychometric properties and internal consistency have been validated by various researchers (Herzog Jr et al., 1991). Since marine life is a subcategory of animals, using AAS to test marine life attitude does not undermine its validity. The original Animal Attitude Scale (AAS) is a 5-point Likert scale generated for testing human-animal relationship (Herzog et al., 2015). It consists of 20 articles that require grading from "strongly disagree" to "strongly agree" (Herzog et al., 2015; Taylor & Signal, 2005). We created a marine life version of the AAS by adapting the original, focusing on marine life and maritime activities rather than general animals and human behavior, and without altering the original meaning or themes. When necessary, examples of marine life were given to help clarify the statement in our questionnaire. Following the original AAS, most sentences are scored from 1 (strongly disagree) to 5 (strongly agree), while reversed statements are scored the other way around (Herzog et al., 2015). Therefore, higher marks on our marine life AAS denote a greater concern (Taylor & Signal, 2006) for marine life protection. An example of this adapted scale included "Basically, humans have the right to use marine life as we see fit". Furthermore, we gave special attention to five of the subtopics of AAS intended to assess attitudes towards different purposes of using marine life (Herzog et al., 2015), including food, medical research, hunting/fishing, skin/fur, and commercial slaughter.

2.2.3 Procedure and Participants

Our online survey was performed by Kurundata, a certified data company which has supported a series of online research projects. In Kurundata's internal panel, residents aged below 18 years old or were not living in one of the 22 coastal cities were screened out. By means of stratified random sampling (Acharya et al., 2013), the system randomly selected target respondents in each city and sent them an invitation to our online questionnaire. The participants were informed that all the information they provided would be kept confidentially and would only be used for scientific purposes. Respondents filled in this questionnaire based upon their own judgements and preferences. This study was conducted under protocols approved by Maastricht University's Ethical Review Committee Inner City faculties (reference code ERCIC-238-26-02-2021). A total of 500 valid responses were collected from 1459 distributed questionnaires. With a mean age of 29.6 (*SD* = 7.6), our research sample is comprised of 59% female and 41% male respondents that live in coastal areas of mainland China.

2.2.4 Statistical Analysis

We imported and analyzed the data in IBM SPSS 25 software. The statistics in this project are mostly either normally distributed or could be normalized through Blom's formula (Phillips et al., 2012). Only data in two AAS subtopics (skin/fur and commercial slaughter) cannot be normalized by this formula nor by logarithmic method. We still treat them as normally distributed as existing academic works justify their validity in large (over 500) dataset (Lumley et al., 2002). Various statistical methods and tests were applied to explore public attitudes towards marine life. First of all, descriptive analyses were performed to capture the fundamental attributes of the sample. Reversed questions in the marine life version of the AAS were also conversely coded before calculating their values. Several mean comparison tests were then performed to assess differences on attitudes towards marine life. Independent samples *t*-tests (with Levene's test for equality of variance), paired samples *t*-test and one-way ANOVA (with test of homogeneity of variance) were performed according to different variable types. Noting that type I errors may have an effect on our results, we introduced Bonferroni correction for multiple comparisons. Moreover, the Pearson correlation test was carried out so as to obtain more details about how demographics could influence attitudes towards marine life. In addition, we applied simultaneous linear regression to explore the predictors of marine life attitude. Being aware of the possible mutual effect from variables, the interaction between age and gender, idealism and relativism were also adopted into regression analysis. Besides, a simple effect or simple slope test would be followed up if a mutual effect were testified. An alpha value of 0.05 was consistently employed during the whole analysis process, in which any non-explanatory variable would not be taken into consideration (McDonald, 2009).

2.3 Results

2.3.1 Human Demographics

In general, our respondents are relatively young: 64.4% are between 18 and 30 years old, 28.8% between 31 and 40 years old, and only 6.8% 41 years old or above. Sixty percent of our valid responses come from south China and 40% from north China, separated by the Qingling-Huaihe Line. Urban inhabitants (92.6%) make up the sample majority. That few data come from rural areas (7.4%) may be due to the fact this survey was offered online, since younger people and urban residents have better internet access than seniors or rural residents. In addition to age and location, some other basic features of the participants are displayed in Table 2.1.

Items (N=500)	***n*(%)**
Educational background	
Less than high school	2(0.4)
High school	17(3.4)
Junior college program	63(12.6)

University bachelor degree	349 (69.8)
Master degree and above	69(13.8)
Occupation	
Liberal Profession	36(7.2)
Civil Servant/Public Institute	85(17)
Employee (Enterprises)	273(54.6)
Self-employed	44(8.8)
Retired	2(0.4)
Student	50(10)
Social Welfare	1(0.2)
Other	3(0.6)
No Answer	6(1.2)
Average personal income per month (rmb/month)	
X ⩽2,000	10(2.0)
2,000 < X ⩽ 4,000	32(6.4)
4,000 < X ⩽ 6,000	75(15.0)
6,000 < X ⩽ 8,000	105(21.0)
8, 000 < X ⩽ 10, 000	129(25.8)
10, 000 < X	143(28.6)
No answer	6(1.2)
Attitude to religion/spirituality	
Important	338(67.6)
Not important	162(32.4)
Companion animal caretaker	
Yes	382(76.4)
No	118(23.6)
Meat (including fish) eating frequency	
Vegetarian/Vegan	12(2.4)
Once a week	43(8.6)
2-3 days a week	100(20.0)
4-6 days a week	237(47.4)
Everyday	108(21.6)
Aquarium/zoo visiting frequency	
Once a month or less than a month	131(26.2)
Once a half-year	196(39.2)
Once a year	99(19.8)
Once two years or more than two years	61(12.2)
Never	13(2.6)
Beach visiting frequency	
Everyday	14(2.8)
Once or twice a week	72(14.4)
Once or twice a month	179(35.8)
Once or twice a half-year	157(31.4)
Once a year	42(8.4)
Once two years or more than two years	36(7.2)
Never	0(0)

Table 2.1 Basic Information of Respondents

2.3.2 The EPQ

In this segment, Cronbach's alpha reached 0.939, implying strong internal consistency of the questions (Taber, 2018). On average, our respondents scored 6.72 (*SD* = 1.46) on the idealism band and 6.24 (*SD* = 1.37) for the relativism band. Dependent on these two cut-off values, situationists accounted for the biggest share of our participants (42.6%), followed by

exceptionists (32.6%), absolutists (15.6%) and subjectivists (9.2%). The differences between the three age groups were significant regarding the relativism dimension ($p < .05$): 18-30 years olds had a higher score ($M = 6.35$, $SD = 1.36$) than 41 years old and above ($M = 5.66$, $SD = 1.12$, $p < .05$). However, no such significant difference was observed between age groups, for the idealism dimension. For gender, we also discovered no significant difference in either the idealism or relativism scales. The idealism scale was positively correlated with relativism (Pearson's $r = .689$, $p < .001$), however. Although post hoc tests showed no significant difference between religions, citizens who considered religious beliefs to be important in life attained a higher grade in both the idealism and relativism dimensions than those who did not (both $p < .05$).

2.3.3 Marine Life Attitude (Animal Attitude Scale) and Subtopics

The marine life version AAS in our questionnaire obtained a Cronbach's alpha of 0.804, denoting good reliability of this division (Taber, 2018). In the present study, the average marine life AAS score was 64.84 ($SD = 7.09$) out of 100. This is a little higher than the animal attitude score in Chinese ($M = 63.07$, $SD = 7.83$) society (Su & Martens, 2017). Despite its initial skewness and kurtosis values implying non-normality, the distribution of AAS-marine life scores reached normality after transforming (as Table 2.2 presented).

	N	Skewness		Kurtosis	
		Statistics	*SD*	Statistics	*SD*
Marine Life Attitude Score	500	0.439	0.109	0.030	0.218
Normalized Score	500	0.003	0.109	-0.074	0.218
Valid N (listwise)	500				

Table 2.2 Normality Test Statistics

Women scored ($M = 65.48$, $SD = 7.29$) significantly higher than men ($M = 63.91$, $SD = 6.70$) on this scale (t (498) = -2.319, $p = .021$, $d = 0.02$). Results also revealed gender was important to marine life attitudes, although Pearson correlation coefficient ($r = .103$, $p < .05$) indicated a weak positive connection. Nonetheless, we did not find any significant difference across different age groups on marine life attitude. Throughout our dataset, we captured no significant differences between North and South China, educational background, social-economic status and other demographics on marine life attitude. We did observe significant differences between different beach visiting frequencies and marine life attitudes (F (5, 494) = 2.46, $p = .032$, $\eta^2 = 0.02$), while multiple comparisons showed the attitude differences between each group is not significant.

Table 2.3 informs the means and paired comparison results of five selected AAS-marine life subtopics. Due to revising, the "Skin/Fur" subtopic in the present study only includes question 4, rather than 4 and 14 from the original AAS (Herzog et al., 2015). The mean of subtheme "Skin/Fur" is the highest, while "Food" subtheme is the lowest in values. By taking a closer look at the pairwise comparisons of five AAS-marine life subtopics, we found the score of "Food" to

be significantly lower and "Skin/Fur" significantly higher than the other four subtopics. As these subscales are grounded in different quantities of questions, we are hesitant to draw absolute conclusions from pairwise calculations.

Subtopics	Question Number	Mean/*SD*	Paired Comparison *t*/*d* values (*df* = 499, all *p* < .001)			
			Medical research	Hunting/Fishing	Skin/Fur	Slaughter
Food	6,8,18	2.713/0.707	-6.749/0.30	-14.834/0.66	-23.001/1.03	-15.676/0.70
Medical Research	2,7,16	2.945/0.641		-9.229/0.41	-20.878/0.93	-13.469/0.60
Hunting/Fishing	1,5	3.321/0.708			-15.089/0.67	-7.474/0.33
Skin/Fur	4	4.03/0.943				6.052/0.27
Slaughter	10	3.72/1.068				

Table 2.3 Means and Paired Comparison Results of Selected AAS-Marine Life Subtopics

Furthermore, we also uncovered some significant differences between human demographics and these subtopics. Men (M = 8.57, SD = 2.06) scored lower on the "Medical Research" subscale than women (M = 9.02, SD = 1.81, t (401) = -2.507, p = .013, d = 0.02). Urban residents (M = 6.68, SD = 1.42) scored higher on "Hunting/Fishing" subtopic than rural residents (M = 6.16, SD = 1.32, t (498) = 2.149, p = .032, d = 0.02). Attitude on the "Food" subtopic is also significantly different among citizens in different occupations (F (8, 491) = 1.985, p = .046, η^2 = 0.03), coastal cities (F (21, 478) = 1.832, p = .014, η^2 = 0.07), and beach visiting frequencies (F (5, 494) = 2.434, p = .034, η^2 = 0.02). Nevertheless, multiple comparisons demonstrated no significant difference between each occupation, coastal city, aquarium and beach visiting frequency.

2.3.4 Basic Demographics and Ethical Ideology on Marine Life Attitude

As our main research question is whether basic human demographics (such as age and gender) and moral ideology (idealism and relativism) influence public attitudes towards marine life, we took these factors into further examination. Two interactions, age*gender interaction and ethical idealism*ethical relativism interaction, were also taken into consideration as we are interested if mutual effect exist. A simultaneous linear regression analysis indicated that gender, idealism, relativism, and age*gender interaction were influential factors on marine life attitude as Table 2.4 shows. Beta coefficients and t-values in this table suggest that idealism has a positive correlation with marine life attitude, while relativism correlates negatively.

AAS-Marine Life (*df* = 6, *F* = 7.112, *R* = 0.282)	Unstandardized Coefficients		Standardized Coefficients Beta	*t*	*p*
	B	*Std. Error*			
Constant	62.353	1.057		58.987	< .001
Gender	1.599	0.634	0.111	2.523	.012
Age	0.229	0.133	0.245	1.727	.085
EPQ Idealism	1.520	0.342	0.314	4.447	< .001
EPQ Relativism	-1.623	0.338	-0.313	-4.795	< .001
Interaction Idealism*Relativism	-0.124	0.113	-0.057	-1.090	.276
Interaction Age*Gender	-0.196	0.082	-0.338	-2.385	.017

Table 2.4 Influence of Basic Human Demographics and Ethical Ideology on Marine Life Attitude

Regression model verified the mutual effect from age and gender on marine life attitude. A two-way ANOVA test was carried out to better describe how age influence different gender on attitudes towards marine life as well as how attitudes from men and women change in different age groups. ANOVA results demonstrate the influence of age*gender interaction is small while noticeable (F (5, 494) = 6.84, p = .002, η_p^2 = 0.04). Table 2.5 presents the simple effect test outcomes. In the 18-30 year old group, women scored significantly higher than men. There was no attitude difference between men and women in the 31-41 year old or 41 year old and above group. Both men and women significantly shifted their attitudes towards marine life when comparing the 31-40 year old group with the 18-30 year old group. Men in the 31-40 year old group obtained significantly higher grade whereas women in this age group gained significantly lower grade than their 18-30 year old group equivalents. In contrast, neither men nor women hold significantly different attitude when comparing to 41 year old and above group.

Age Group	Gender	Mean	*SD*	*n*	Comparison		
18-30	Male	62.97	5.840	110	Male	F (2,494) = 3.948	18-30 < 31-40 (p = .031)
	Female	66.10	7.606	212		p = .020, η_p^2 = 0.02	
31-40	Male	65.66	7.648	76	Female	F (2,494) = 3.147	18-30 > 31-40 (p = .038)
	Female	63.54	6.417	68		p = .044, η_p^2 = 0.01	
41 ≤	Male	62.32	6.129	19	18-30	F (1,494) = 13.140	Male < Female (p < .001)
	Female	65.53	4.749	15		p < .001, η_p^2 = 0.03	

Table 2.5 Age and Gender Interaction on Marine Life Attitude

The mutual effect from moralities was proved non-significant to attitudes towards marine life. That said, it is still possible to see how much each ethical group score on marine life attitude in China. According to our data, the average scores of four ethical clusters on the AAS marine life version were 64.73 (SD = 7.22) for situationists, 63.59 (SD = 6.28) for exceptionists, 68.05 (SD = 7.29) for absolutists, and 64.28 (SD = 7.39) for subjectivists. One-way ANOVA analysis revealed their difference is significant (F (3,496) = 6.977, p < .001, η^2 = 0.04). Absolutists scored notably higher than the other three groups (all p < .05). Subsequently, we further delved into the research question of whether human demographics and moral ideology are influential to the five selected AAS marine life subtopics. Table 2.6 summarizes the linear regression results of selected subtopics.

Subtopic (*B* / *t*)	Food	Medical Research	Hunting/Fishing	Skin/Fur	Slaughter
Age					
Gender		0.398/2.250*			
EPQ Idealism			0.285/4.109*	0.182/4.036*	0.193/3.755*
EPQ Relativism	-0.408/-3.997*		-0.291/-4.246*		
Interaction I*R				-0.036/-2.416*	
Interaction A*G					

Note: * p < .05

Table 2.6 Influence of Basic Human Demographics and Ethical Ideology on Selected Subtopics

According to the outcomes listed in Table 2.6, we recognize that human demographics are less influential than ethical ideology to these different marine life subscales. Gender is only correlated with the subtopic of "Medical Research". Age and the interaction of age and gender have no effect on any subtopic. Conversely, it is apparent that ethical ideology has a pivotal role in nearly all five subtopics. Ethical idealism gained positive beta coefficients and *t*-values on "Hunting/Fishing", "Skin/Fur" and "Commercial Slaughter" subtopics, denoting its positive relation to public attitudes towards using these marine life categories. Ethical relativism had negative beta coefficients and *t*-values on "Food" and "Hunting/Fishing" subtopics, representing its negative connection with the public perception of utilizing marine life for food and fishing entertainment. The interaction between idealism and relativism turned out to be influential on "Skin/Fur" subtheme. Noticeably, ethical idealism and relativism are both dominant factors in public attitudes towards "Hunting/Fishing". Yet, neither the two ethical orientation nor their interaction is instrumental in the theme of "Medical Research".

Views also vary on these AAS marine life subtopics amongst four ethical groups. Absolutists scored highest on "Medical research", "Hunting/Fishing", 'Skin/Fur' and "Commercial Slaughter" four subtopics and second highest on "Food" subtopic. As Table 2.7 informed us, four ethical groups have significant differences on five subtopics except "Medical Research". We narrowed our attention to absolutists as this group scored a higher value on most of the subtopics. We found that absolutists scored higher than situationists and exceptionists on the subtopic of "Hunting/Fishing" (both $p < .05$). Absolutists also scored higher than exceptionists on "Skin/Fur" ($p < .001$) and "Commercial Slaughter" ($p = .001$) subtopics. Furthermore, situationists had lower grades than exceptionists on the "Food" ($p < .05$) subtopic.

***M* and *SD* of selected subtopics**	**Food**	**Medical Research**	**Hunting/Fishing**	**Skin/Fur**	**Slaughter**
Situationists	7.80 ± 2.172	8.79 ± 1.971	6.61 ± 1.415	4.15 ± 0.867	3.84 ± 1.034
Subjectivists	7.91 ± 1.930	8.63 ± 1.913	6.50 ± 1.378	4.11 ± 0.823	3.59 ± 1.147
Exceptionists	8.55 ± 2.141	8.85 ± 1.807	6.48 ± 1.407	3.67 ± 1.036	3.45 ± 1.055
Absolutists	8.33 ± 1.898	9.05 ± 2.044	7.14 ± 1.374	4.41 ± 0.763	4.01 ± 1.026
Mean Difference (one-way ANOVA)	F (3, 496)= 4.261, p = .005, η^2 = 0.03	F (3, 496)= 0.544, p = .652	F (3,496) = 4.166, p = .006, η^2 = 0.02	F (3, 496) = 14.254, p < .001, η^2 = 0.08	F (3,496) = 6.685, p < .001, η^2 = 0.04

Table 2.7 Ethical Position Differences on Selected AAS-Marine Life Subtopics

2.3.5 Marine Life Attitude and Other Explainable Factors

Apart from gender, there are some other human demographics we found effective in interpreting public attitudes towards marine life. These demographical factors are illustrated in Table 2.8.

AAS-Marine Life (df = 6, F = 5.943, R = 0.330)	**Unstandardized Coefficients**		**Std.Coefficients Beta**	***t***	***p***
	B	*Std. Error*			
Constant	64.629	0.483		133.851	< .001
City - Wenzhou	9.797	3.470	0.157	2.823	.005
City - Tianjin	3.987	1.675	0.132	2.380	.018

Beach-visiting 1-2 times/week	3.129	1.027	0.173	3.045	.003
Religious Beliefs - Catholicism	-3.702	1.333	-0.157	-2.777	.006
Occupation - Liberal Profession	-4.207	1.720	-0.136	-2.447	.015
Caretaker - Rodents	-4.949	2.211	-0.124	-2.238	.026

Table 2.8 Other Important Variables to Marine Life Attitudes

2.4 Discussion

This research examined how basic human demographics, such as age and gender, and ethical ideology influence attitudes in contemporary Chinese society towards marine life. We found that both gender and ethical ideology are important determinants. Women, particularly in younger generation, tend to be more concerned about marine life protection in China. Results from this study enrich our understanding of human-marine life interactions and sustainable human-nonhuman animal relationships.

2.4.1 Marine Life Attitude

Generally, our outcomes suggest that the majority of coastal Chinese citizens have favorable attitudes towards marine life protection. Despite different scales employed to measure public attitudes, it can be concluded that Chinese citizens show similar levels of concern for marine life protection compared to people in other studied countries, such as the U.S. (Kellert, 1999), Greece (Dimopoulos & Pantis, 2003), Panama (Hoehn & Thapa, 2009), Germany and Israel (Freeman et al., 2012). A variety of factors may contribute to the favorable attitudes of the Chinese. In civic society, marine environmental NGOs have actively engaged in different kinds of marine life protection activities and gradually enlarged their influence in Chinese society during the past decades (Qiu et al., 2009). Increasing involvement from the central government also plays a critical role. In 2015 and 2017, the central government approved “Action Plan for Preventing and Treatment of Water Pollution” and “Action Plan for Preventing and Treatment of Offshore Pollution” (Reference numbers: 000014349/2015-00042 and 000014672/2017-00323). Marine environment and biodiversity protection have subsequently become a national strategy. Furthermore, large-scale maritime disasters, such as the Penglai 19-3 Oil Spill, have also deepened public concerns for marine life to a certain degree (Liu et al., 2016).

Many earlier studies have highlighted the gender difference in attitudes towards animals and noticed that women generally are more concerned about animal wellbeing (Herzog Jr et al., 1991; Taylor & Signal, 2005). Our study confirms the same correlation for marine life: compared to men, women are more concerned with marine life and marine life protection. This is especially clear in younger generation (18-30 year old group). Tentative reasons given in the animal research literature are, for example, social-culture context (Hills, 1989), biological urges (Herzog Jr et al., 1991) and different moral orientations (Kellert & Berry, 1987). A preceding

animal study conducted in China, however, concluded that Chinese men and women equally respect animals as an indispensable part of society (Su & Martens, 2017). This different outcome may have resulted from the fact the two studies concentrated on different areas. As Herzog (2007) pointed out, gender difference in attitudes towards other species differs depending on the type of interaction. Our research centered on attitudes towards marine life in coastal areas. The interaction between human society and marine life is by no means the same with animals in a general sense or in whole mainland China.

Although some literature reports attitude differences between age groups (Kellert, 1999), our research did not capture such age differences in Chinese public attitudes towards marine life. Residents in different age groups exhibited a relatively similar level of marine life awareness. This differs from the findings of Su and Martens (2017), where the elderly were observed to be more negative towards animal protection as well as animal welfare. Two factors may explain this phenomenon. Unlike the general case of animals, marine life protection requires the popularization of specialized maritime knowledge (Fletcher et al., 2009). Education about marine life has been largely ignored, however, for the past decades in mainland China. This is also a global issue since low level knowledge regarding marine life has already been observed in different countries (Dimopoulos & Pantis, 2003; Freeman et al., 2012). Now that both the young and the elderly generally have the same information about marine life, it is reasonable to expect that they can be equally concerned about marine life. Moreover, the unevenly distributed research sample may also have played a role here. As stated before, our respondents are relatively young because of the online survey method. The senior group has far fewer samples than the youth group. Therefore, the observed insignificance of difference between age groups might also result from the sample, to a certain degree.

Our analysis also shows a clear link between attitudes towards marine life and the mutual effect of age and gender. Chinese men and women show different attitudes towards marine life dependent on age. As aforementioned, women are usually better aware of animal/marine life protection. Yet in age group 31-40, Chinese women are obviously less concerned about marine life than 18-30 year group. Interestingly, the opposite change happens to Chinese men. They are more friendly to marine life in age group 31-40 than 18-30. We assume this to be related to the societal context of marriage in China. Over the last years, the marriage age has increased in coastal areas. According to a news report from China Youth Daily (2018), the mean first marriage age (male/female) was 30.3/28.4 in Shanghai (2015), 34.3/34.1 in Jiangsu province (2017) and 28.2/28.4 in Qingdao (2017). Chinese citizens in coastal areas normally marry in their 31-40s. Noting that marital status could influence individual animal attitude (Kafer et al., 1992) as well as lifestyle (Kravdal, 2001), it may be expected that both Chinese men and women change their marine life attitude in the age range 31-40. However, it remains unclear how marriages could specifically contribute to the attitude change towards marine life in China. Further investigations are still needed to better explain how marriages trigger the public attitude change towards marine life. Additionally, contrary to some previous animal studies (Hayes et al., 2015), we report no significant differences between North and South China,

educational background, social-economic status or other demographic factors on marine life attitude, among our respondents.

2.4.2 Subtopics of Marine Life Attitude

The findings of our study supplement an emerging body of research on the public attitudes towards how we treat marine life. Judging from our respondents' preferences of the five selected subtopics (food; medical research; hunting/fishing; skin/fur; commercial slaughter), we conclude that Chinese citizens have different attitudes towards different marine life practices. It is almost certain using marine life (e.g. fish, shrimps) as food was the most accepted use of marine life for Chinese citizens. Next, using marine life in medical research was found to be acceptable. This also confirms the Chinese animal attitude results found by Su and Martens (2017), which showed that many Chinese consider animal (e.g. rodents) suffering in research experiments to be tolerable. In addition, we found that men are more positive towards using marine life in medical research than women. This may be due to the fact that men are more "thing-oriented" than women (Herzog Jr et al., 1991; Hills, 1989). However, the use of marine life for skin or fur (from seals and sea otters, for example) seemed to be the least acceptable issue for Chinese residents. Aside from the use of skin or fur, respondents were concerned for the commercial slaughter of marine life (whales and dolphins, for example). Together these results suggest that brutalities to marine life (especially for commercial uses) are intolerable to the sampled Chinese population.

2.4.3 Ethical Ideology and Marine Life Attitude

This research also offers new insight in the relationship between ethical ideology and attitudes towards marine life. Recent work has already shown that ethical idealism can considerably affect personal attitudes towards animals (McPhedran, 2009; Su & Martens, 2018). We have substantiated this linkage by filling the knowledge gap concerning marine animals. Our data suggests that ethical idealism is positively correlated with public attitudes towards marine life in Chinese society. The greater respondents believe that good actions will have desirable consequences, the more they value the protection of marine life. First of all, idealistic morality is intrinsically incorporated in the concept of accomplishing decent outcomes (Forsyth & Pope, 1984). Protecting marine animals and improving their living surroundings, for example, could help marine biodiversity conservation and mitigate biological resources exhaustion. Moreover, Chinese culture has historically been deeply influenced by Buddhist philosophy (Suen et al., 2007). One of the key messages of Buddhism is to protect all sentient beings and to show altruistic behavior towards them (Yao, 2006). Inspired by this philosophy, Chinese idealistic morality favors a friendly attitude towards marine life.

Further analysis of our data brings to light that ethical relativism is an influential predictor of attitudes towards marine life in China. The more that people question the existence of universal

moral principles, the less they value marine life protection. This is consistent with research regarding public attitudes towards animals in China, which found ethical relativism to be negatively correlated with attitudes towards animals (Su & Martens, 2017). People with a 'relativistic' moral orientation refuse to make judgements relying on universal ethical principles (Forsyth, 1992). Instead, they prefer to act on the grounds of a given context, as well as their own needs. Chinese culture, historically, values instrumentalism and materialism (Lin & Lu Wang, 2010). Following this philosophy, Chinese people would put far more emphasis on the instrumental values of animals (including marine life) than on their intrinsic values. The public are more likely to safeguard fishery resources from exhaustion for the sake of fish consumption rather than caring for fish or their living waters. This could also clarify why using marine life as food triggers the least concern in Chinese society. As our data shows, the impact of relativistic morality on marine life attitude is roughly the same with ethical idealism. Both moralities are equally influential in shaping attitude towards marine life in China.

Unsurprisingly, we discovered that both ethical dimensions and their interaction are predictors for most selected marine life attitude subtopics. Idealism is key in public attitudes towards "Hunting/Fishing", "Skin/Fur" and "Commercial Slaughter". In other words, people who believe ethical behavior will only contribute to good consequences do not appear to accept such actions. Relativism is of vital importance for the attitude towards "Food" and "Hunting/Fishing". When seeing the instrumental value of marine life (food or entertaining), people will sacrifice marine life for their own needs. The interaction of two ideologies is valuable to the subtopic "Skin/Fur". We did not expect that neither of the two dimensions nor their interaction would be connected to the "Medical Research" subtopic. Combined with previous research results suggesting that Chinese society has a relatively high tolerance for animal suffering in experiments (Su & Martens, 2017), we believe such tolerance is closely linked to the unique context of contemporary Chinese society. To begin with, the public awareness of animal rights and animal welfare remains at a low level in Chinese society despite that increasing attention has been drawn to these issues in the past decades (Li, 2006). More crucially, although scientific communities have been aware of animal welfare in laboratory use and formulated relevant regulations, implementation is still far from ideal in contemporary Chinese society (Bayne et al., 2015). Thus, a lack of integration and enforcement of animal welfare and scientific research ethics may underlie the acceptance of using marine life in medical research. Following this inadequate research ethic boundary, the Confucianism and traditional culture may further intensify the tolerance of the scientific use of marine life. Confucianism is the foundation stone of Chinese culture and social norms (Rarick, 2008). Education and knowledge are highly respected and valued in Confucianism (Spring, 2012). The respondents may also simply believe that scientific development far outweighs the welfare of marine life, or ending its use in medical studies. Therefore, as long as pursuing knowledge is the primary goal, research using marine life will likely continue to be acceptable in China.

Another interesting discovery is that in China absolutists hold the most sympathy for marine life among all four ethical positions. With respect to the issues of "Hunting/Fishing", "Skin/Fur" and

"Commercial Slaughter", absolutists express significantly greater concern than situationists, subjectivists, and exceptionists. On the subtopics of "Food" and "Medical Research", they are also more concerned. Absolutists appear to believe that human society ought to take proper care of marine life. According to Forsyth and Pope (1984), absolutism symbolizes people aiming at positive consequences but rejecting universal moral codes. This discovery confirms our research conclusion that people with a higher level of idealistic morality and lower level of relativistic morality tend to be more positive about marine life and marine life protection.

2.4.4 Other Predictors of Marine Life Attitude

We also found that the species of the Chinese respondent's companion animal (especially rodents), as well as their religious beliefs (especially Catholicism) are two influential factors on attitudes towards marine life. This corresponds to public attitudes towards animals in China found by Su and Martens (2017). Residential city, occupation, and beach visiting frequency are three other indicators of marine life attitude. The former could possibly be the reason for different social contexts in different cities, such as the number and size of aquariums, the popularization of marine life knowledge, and the funding received from local governments. The latter two involve the issue of human interaction. In some occupations (such as liberal professions), people have more time to go to the beach or otherwise connect with marine life.

2.5 Conclusion

This study has investigated public attitudes in Chinese society towards marine life and determined the roles of basic demographics and ethical ideology in shaping this attitude. Our results demonstrate that Chinese women are more concerned about marine life protection than men. Ethical idealism is positively correlated with concern about marine life while ethical relativism is negatively correlated. Chinese citizens generally consider using marine life for food acceptable, but less acceptable for using their skin or fur. Ethical ideology is found to have no influence upon public attitudes towards using marine life for testing in medical experiments. Given that this study copes with marine life in a broad sense, future projects are encouraged to pay attention to public attitudes towards specific marine species, such as sharks and dolphins, since few such studies have been performed in the Chinese context.

Our research has several obvious limitations. Because of the online survey method, we did not collect as much data from coastal rural areas and the elderly as we had anticipated. This partly explains why we did not find any statistically significant differences between urban and rural attitudes from our dataset. Other research methods, such as interviews and focus groups, may in the future assure a more balanced distribution of participants and thus provide with additional information on Chinese attitudes towards marine life.


3

Chapter 3

Environmental Concern and Public Attitudes toward Marine Life in Coastal China

Abstract
The relationship between the people's concern for the environment and their attitudes toward marine life remains ambiguous, especially in developing countries such as China. This chapter reports results from an online survey (n = 500) conducted in 22 Chinese coastal cities regarding the relationship between public attitudes toward marine life and environmental concern, as well as environment-related behavior. The New Ecological Paradigm (NEP) Scale was used to assess respondents' environmental concern. Attitudes toward marine life protection were measured using a revised version of the Animal Attitude Scale (AAS). Including some questions on demographics and environment-related behaviors and preferences, the questionnaire aimed to investigate human–marine life interactions in coastal Chinese society. The data revealed that people living in coastal China mostly endorsed a pro-ecological worldview, while being rather passive in environmental public participation. All five dimensions of environmental concern were positively correlated with marine life attitude and associated with selected AAS content categories (human moral dominance, food, medical research, and hunting/fishing) to varying degrees. Anti-anthropocentrism was found to be the most important dimension of NEP in understanding marine life protection and the use of marine life. It was also discovered that some environment-related behavior, such as beach visits, NGO membership/donations, and transportation preferences, were predictors of attitudes toward marine life and marine life usage. Findings from this study highlighted three significant concepts in shaping public perception of marine life: the recognition of human domination, moderation, and potential environmental risks.

Keywords
Environmental Concern, Public Attitude, Marine Life, China, Anthropocentrism, Human–animal Interaction

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3.1 Introduction

Knowledge of public awareness of marine life is a stepping stone for the preservation of marine biodiversity and coastal ecosystems (Luksenburg & Parsons, 2014; Tonin & Lucaroni, 2017). Since the end of the last century, social scientists have begun to investigate how citizens perceive marine life and marine life-related issues. Some scientists have examined the attitudes of specific societal communities, such as fishermen (Braga & Schiavetti, 2013b; Hoehn & Thapa, 2009), tourists (Giglio et al., 2015; Kidd & Kidd, 1997), and students (Dimopoulos & Pantis, 2003). A number of studies have looked into public attitudes toward marine life-related industries, such as aquaculture (Bacher et al., 2014; Freeman et al., 2012; Hynes et al., 2018; Whitmarsh & Wattage, 2006), fisheries (Hayes et al., 2015; Kincaid & Rose, 2014), and coastal tourism (Zeppel & Muloin, 2008). Other studies have investigated the public perception of certain social issues stemming from marine life, such as shark bites (Neff & Yang, 2013), fish fin trade (Cheung & Chang, 2011), and biodiversity protection (Gkargkavouzi et al., 2019; Halkos & Matsiori, 2017; Tonin & Lucaroni, 2017). Some marine life species have drawn special attention, such as sea turtles (Senko et al., 2011), sharks (Friedrich et al., 2014; Lee et al., 2016; O'Bryhim & Parsons, 2015), cetaceans (Barney et al., 2005; Naylor & Parsons, 2018; Scott & Parsons, 2005), or marine mammals in general (Kellert, 1999; Kellert et al., 1995; Luksenburg & Parsons, 2014; Sitar-Gonzales & Parsons, 2012). There is also research concerning how individuals view the way we use marine life in human society (Freeman & Kellert, 1994; Kellert et al., 1995). Public attitudes toward marine life are not only connected to demographic factors, such as age and gender (Howard & Parsons, 2006; Luksenburg & Parsons, 2014), but also to personal behavior and experiences, for instance visiting aquariums and fishing (Friedrich et al., 2014; Kellert, 1999). Females, senior citizens, regular aquarium and coast visitors often express higher level of concern about marine life conservation than males, young citizens, and people with limited aquarium and coast visiting experience (Friedrich et al., 2014; Howard & Parsons, 2006).

In recent years, a growing body of survey-based studies has explored public attitudes toward marine life from an environmental perspective. From this research, two ideas have emerged. First, public attitudes toward marine life are associated with several environmental factors, including marine environment perception (Halkos & Matsiori, 2017), marine life knowledge (Dimopoulos & Pantis, 2003), and environmental education (Hayes et al., 2015). Favorable attitudes toward marine life have been linked to a positive attitude toward the marine environment (Friedrich et al., 2014; Gkargkavouzi et al., 2019). An earlier public attitude survey in Greece also revealed that recognition of nature's limits (one dimension of environmental concern) was a strong motivation for individuals to value marine biodiversity (Halkos & Matsiori, 2017). Second, threats to marine life from human society have been highlighted in the existing literature. Researchers have discovered that citizens have major concerns about environmental disasters and pollution, such as chemical and sewage pollution and oil spills, related to their concern for marine life protection (Howard & Parsons, 2006; Luksenburg & Parsons, 2014). Interesting findings also include the links between some environment-related behaviors and

public attitudes toward marine life. A desirable attitude toward marine life is connected with personal behavior such as aquarium visiting (Friedrich et al., 2014; Kidd & Kidd, 1997), engaging in beach sports like fishing, and membership in environmental organisations (Kellert, 1999).

There is limited knowledge from previous studies, however, regarding the relationship between environmental concern (Dunlap & Jones, 2002) and public attitudes toward marine life. Environmental concern refers to the extent to which individuals are aware of and willing to solve environmental problems (Dunlap & Jones, 2002). It represents how people position themselves in the interaction between human society and the environment. Despite some similarities, public attitude toward marine life serves as an independent construct rather than a part of environmental concern. Instead of addressing ecological threats to human society or aiming at solving environmental problems, public attitude toward marine life research targets at analyzing the correlation between human and marine life and emphasizes the value of marine life protection for its own sake rather than to humanity. Judging by earlier studies, how individuals recognize their interaction with the environment may be in connection with people's understanding of marine life using in modern society. Additionally, it is worth noting that most previous research has concentrated on European and North American countries, with limited information available on the situation in contemporary Chinese society, particularly in coastal China.

Due to geographic conditions, coastal residents have more frequent and direct interactions with the oceans than inland citizens. Earlier studies have discovered that coastal Chinese are more environmentally friendly than people living in inland regions (Liu & Mu, 2016). It is expected that coastal citizens are more aware of marine life conservation in China. Serving as a major actor in fishery and seafood production and consumption worldwide (FAO, 2020), China is confronting huge challenges in the protection of marine life and biodiversity (Liu, 2013; Sun, 2018). So far, there has been hardly any research exploring how coastal Chinese perceive marine life and marine life use in the scientific community. Based on previous research (Halkos & Matsiori, 2017), it is assumed that environmental concern is a key driver in Chinese attitudes toward marine life protection, but it remains unclear how strong this correlation is and what elements in environmental concern are especially influential on this public attitude.

Given that no research has been conducted on the relationship between environmental concern and public attitudes toward marine life in China, this study aimed to fill this knowledge gap through a questionnaire based on the New Ecological Paradigm (Dunlap et al., 2000) to measure public environmental concern, and the Animal Attitude Scale (Herzog et al., 2015) to measure attitudes toward marine life. In this research, there were three central questions: 1. In terms of environmental concern, what are coastal citizens' environmental attitudes in contemporary Chinese society? 2. What is the relationship between environmental concern and public attitudes toward marine life and marine life uses in coastal Chinese society? 3. What kinds of environmental factors (concern or related behavior) are predictors of public attitudes

toward marine life and marine life use in coastal China? Alongside the two research questions, special attention was given to public attitudes toward some marine life use and issues, such as food, medical research, hunting/fishing, and human moral domination, not only to make full use of the Animal Attitudes Scale, but also to pave the way for further discussion about attitudes to marine life in coastal Chinese society.

3.2 Methods

This study was conducted under protocols approved by Maastricht University's Ethical Review Committee Inner City faculties (reference code ERCIC-238-26-02-2021).

3.2.1 Survey

Data were collected via an online survey due to its unique features of being fast, convenient and cost efficient in investigating public perceptions (Babbie, 2013), as well as the budget and time constraints of this study. Existing literature suggests that data collected through the internet are as valid as paper-based surveys (Knapp & Kirk, 2003). With the help of Kurundata, a certified internet research company that has a database of more than 2.3 million citizens all over China, our survey was carried out from September 17th to October 8th, 2018 in 22 mainland coastal cities [1]. The 22 cities were chosen not only because they were all geographically situated along the coast, but also because the Chinese State Council defines them as "coastal open cities" or "special economic zones" in national policies [2]. By adopting stratified random sampling (Acharya et al., 2013), citizens aged 18 and above and currently living in those 22 coastal cities were targeted and received an invitation to participate in our online questionnaire. In total, 1,459 invitation letters were sent out. The survey, originally designed in the English language, was translated following a forward and backward translation procedure (Tsang et al., 2017) to guarantee reliability in the Chinese language version.

3.2.2 Questionnaire

The questionnaire was prefaced with a cover letter and comprised three independent sections (see online supplemental file). The first section asked for information concerning the demographic information of the respondents, such as gender, age, and educational background. Questions relating to personal behavior, such as frequency of beach visits each year, NGO membership, and preference of choosing transport forms, were also included in this part.

The second section addressed public environmental concern. To date, a wide range of academic work has employed the New Ecological Paradigm (NEP) scale to measure public environmental concern. This scale, developed by Dunlap and colleagues (1978; 2000), was designed to measure individual endorsement of a pro-ecological worldview. The NEP is a 15-item self-rating Likert scale with responses ranging from 1 "strongly agree" to 5 "strongly disagree" (Anderson, 2012; Dunlap et al., 2000). Participants were asked to rate how much they approved or

disapproved of different items. The NEP incorporates five hypothesized dimensions of environmental concern: the reality of limits to growth (questions 1/6/11), anti-anthropocentrism (questions 2/7/12), the fragility of nature's balance (questions 3/8/13), rejection of exemptionalism (questions 4/9/14), and the possibility of an eco-crisis (questions 5/10/15). Citizens' environmental beliefs and doubts are primarily illustrated through their affirmation of each dimension. NEP score is an indication of how individuals recognise environmental degradation and the position of human beings in the whole world (Dunlap et al., 2000; Stern et al., 1995). The higher the total score on the NEP scale, the greater the concern for the environment. Examples of items are "Humans are seriously abusing the environment" and "The balance of nature is very delicate and easily upset". In this section, the Cronbach's alpha was 0.706, implying satisfactory internal consistency (Iacobucci & Duhachek, 2003). A cut-off value of 45 was also set to classify citizens into supportive or ambiguous groups in terms of ecological worldview (Rideout et al., 2005).

The third section assessed public attitudes toward marine life. In the field of marine life studies, there is no equivalent metric as the NEP scale, while the ample scales in animal attitude studies offer the chances to explore human attitudes toward marine life. As marine life is essentially a part of nonhuman animals, instruments designed for assessing animal attitudes are also valid and applicable for investigating marine life attitudes. The Animal Attitude Scale (AAS), created by Herzog et al. (1991), is one of the most commonly used tools for measuring public attitudes toward animal protection and animal use (Herzog et al., 2015). It is composed of 20 statements regarding the different purposes of animal use (Herzog et al., 2015; Herzog Jr et al., 1991). Responses range from 1 "strongly disagree" to 5 "strongly disagree", and a higher score on the AAS denotes better awareness of animal protection. Questions in this scale touch on many high-profile human–animal interaction topics, such as human moral dominance (questions 9/12/13), food (questions 6/8/18), medical research (questions 2/7/16), and hunting/fishing (questions 1/5; (Herzog et al., 2015). The good psychometric properties of the AAS make it suitable for public awareness inquiries (Herzog et al., 2015). A marine life version of AAS was developed by replacing the description of animals and human behavior in original questions, like cats, dogs, and circus, with marine life and maritime activities, like dolphins, sharks, and aquariums, without altering the original meaning or intentions. Examples of statements include "Basically, humans have the right to use marine life as we see fit", and "I sometimes get upset when I see marine life in water tanks at aquariums". This revised scale achieved good reliability with a Cronbach's alpha of 0.804 (Taber, 2018).

3.2.3 Statistical Analysis

All statistical analyses were completed using the scientific software IBM IPSS 25. Most of the data in this study were either normally distributed or could be transformed into a normal distribution through Rankit's formula (Bliss et al., 1956). We first ran a descriptive analysis to capture the basic traits of the respondents, such as mean age and gender. Reverse items in NEP

(even numbers) and AAS-marine life (2, 5, 6, 8, 9, 12, 13, 14, 15, 16, 18) were reverse coded before calculating their values. After that, a series of tests (independent samples t-test, paired samples t-test, and one-way ANOVA test) were performed to examine public environmental concerns about and attitudes toward marine life. To better interpret test results, Levene's test was concurrently performed to assess the homogeneity of variance. For multiple comparisons (more than three groups), a Bonferroni correction was conducted to reduce the chance of Type 1 errors. Several stepwise linear regression tests were conducted to verify the relationship between environment-related behavior, environmental concern, and marine life attitudes. The aforementioned four AAS content categories were also included in the linear regression analysis. An alpha value of 0.05 was consistently employed during the whole analysis process.

3.3 Results

3.3.1 Respondents

The online survey resulted in a sample consisting of 500 valid responses (of 550 replies). There were 59% female and 41% male respondents, with a mean age of 29.63 years (*SD* = 7.6). Participants' answers to some demographical and environment-related behavior questions are summarised in Table 3.1. Since respondents required internet access to take part in our study, our sample was unevenly distributed in terms of age and residential location. Considering that urban youth make up the majority of Chinese netizens (CNNIC, 2018), it is not surprising that this survey involved a large sample of young people. It should be noted that some of the statistics in this segment, such as age, gender, and beach visits, are also reported in another study using the same dataset (Chen & Martens, 2022b).

Questions (N = 500)	*n*/%	Questions	*n*/%
Age group		***Beach visiting frequency***	
18-30 years old	322/64.4	Everyday	14/2.8
31-40 years old	144/28.8	Once or twice a week	72/14.4
41 years old and above	34/6.8	Once or twice a month	179/35.8
Residential location		Once or twice a half-year	157/31.4
Urban areas	463/92.6	Once a year	42/8.4
Rural areas	37/7.4	Once two years or more than two years	36/7.2
Educational background		Never	0/0
Less than high school	2/0.4	***Beach visiting purpose***	
High school	17/3.4	Nature environment (sunshine, waves, etc.)	300/60
Junior college program	63/12.6	Beach sports (swimming, surfing, etc.)	70/14
University bachelor degree	349/69.8	Leisure atmosphere (relaxing, etc.)	77/154
Master degree and above	69/13.8	Recreational activities (photographing, etc.)	53/10.6
Geographical area (Qingling-huaihe boundary)		Others	0/0
South China	300/60	***Clean energy news reading***	
North China	200/40	Actively searching for such news	167/33.4
Car ownership		Carefully reading when media show directly	176/35.2
Yes	433/86.6	Roughly reading when media show directly	144/28.8
No	67/13.4	Never read such news	13/2.6
NGO membership/donation		***Transportation preference (except necessity factors)***	
Improving the welfare of animals	41/8.2	Environmental factor (climate change, etc.)	179/35.8
Conservation of the natural environment	78/15.6	Economic factor (oil price, ticket price, etc.)	159/31.8
Improving human rights or health	55/11.0	Personal preference (space, privacy, etc.)	161/32.2

Not belong or donate to any organization above	326/65.2	Others	1/0.2

Table 3.1 Demographical information and environment related behavior of respondents

3.3.2 New Ecological Paradigm (NEP)

The average NEP total score for this study was 53.83 (*SD* = 6.78) out of 75. Within the five dimensions of NEP, respondents were found to rate the dimension "rejection of exemptionalism" significantly lower than the other four dimensions (see Table 3.2).

Dimensions	**Question Number**	**Mean (*SD*)**	**Pairwise Comparison *t*/*d* values (*df* = 499)**			
			Anti-An	Fragility	Exemption	Eco-crisis
Reality of limits to growth	1,6,11	10.90 (2.02)	-0.124/0.01	**-2.760/0.12**	**10.583/0.47**	**-3.599/0.16**
Anti-anthropocentrism	2,7,12	10.91 (2.24)	N/A	**-2.291/0.1**	**12.344/0.55**	**-2.963/0.13**
Fragility of nature's balance	3,8,13	11.15 (2.01)	**-2.291/0.1**	N/A	**12.825/0.57**	-0.940/0.04
Rejection of exemptionalism	4,9,14	9.63 (2.00)	**12.344/0.55**	**12.825/0.57**	N/A	**-14.046/0.63**
Possibility of an eco-crisis	5,10,15	11.24 (1.86)	**-2.963/0.13**	-0.940/0.04	**-14.046/0.63**	N/A

Note: Anti-An = Anti-anthropocentrism; Eco-crisis = Possibility of an eco-crisis; Significant p – values in bold.

Table 3.2 New Ecological Paradigm dimensions and pairwise comparison results

Judging by the cut-off value, 89% of participants were supportive of a pro-ecological worldview (≥ 45) while 11% were uncertain about it (< 45). Although data analysis revealed there was no statistical difference between different age groups, the researchers found significant differences in NEP scores between gender and geographical areas. Table 3.3 presents the detailed values of each variable on the NEP.

Variables	***n***	***Mean ± SD***	***Means Comparison***
Age Group 18-30	322	53.94 ± 6.736	$F_{(2,497)} = 0.400$ $p = 0.670$*
Age Group 31-40	144	53.79 ± 7.145	
Age Group 41≤	34	52.85 ± 5.566	
Male	205	52.81 ± 7.028	$t_{(498)} = -2.814$, $p = 0.005$, $d = 0.25$**
Female	295	54.53 ± 6.517	
North China	200	52.62 ± 6.722	$t_{(498)} = -3.294$, $p = 0.001$, $d = 0.30$**
South China	300	54.63 ± 6.705	

*One-way ANOVA test **Independent samples *t* test

Table 3.3 Demographic differences on New Ecological Paradigm

3.3.3 Marine Life Attitude (AAS)

Participants in the present study attained a mean grade of 64.84 (*SD* = 7.09) out of 100 on AAS-marine life, as reported in Chen and Martens (2022b)Chen and Martens (2022b)Chen and Martens (2022b). In this study, some connections between AAS-marine life scores and certain environment-related behaviors or preferences were revealed. As Table 3.4 illustrates, significant differences were discovered among NGO membership/donation, beach visit frequency, and transportation preferences. However, we did not detect any differences in car ownership or clean energy news reading habits.

Behavior/Preference	*Variables*	*n*	*Mean ± SD*	*Means Comparison**
NGO membership/donation	human health/rights organizations	55	62.51 ± 6.348	$t_{(498)} = 2.475$, $p = 0.014$, $d = 0.35$
	not to human health/rights organizations	445	65.12 ± 7.129	
Beach visiting frequency	once a year or even less	78	66.86 ± 6.252	$t_{(498)} = 2.879$, $p = 0.004$, $d = 0.35$
	multiple times a year	422	64.46 ± 7.177	
Transportation preference	environmental factor as priority	179	66.22 ± 7.361	$t_{(498)} = -3.319$, $p < 0.001$, $d = 0.31$
	other factor not as priority	321	64.07 ± 6.823	

* Results based on independent samples *t* tests

Table 3.4 Environment related behavior difference on marine life attitude

3.3.4 Environmental Concerns on Marine Life Attitude

An independent samples t-test verified that the difference between the two environmental worldviews on the AAS-marine life score was statistically meaningful ($t_{(498)} = 5.395$, $p < 0.001$, $d = 0.82$). Citizens who held a pro-ecological environmental worldview ($M = 65.43$, $SD = 7.12$) scored substantially higher than people who were uncertain about it ($M = 60.25$, $SD = 4.82$). Once this project established the relationship between AAS-marine life score and environmental concerns, as well as environment-related behavior/preferences, we further investigated NEP scores and environment behavior values. A stepwise linear regression demonstrated that the five dimensions of NEP, beach visit purpose, transportation preferences, and NGO membership were predictors of AAS-marine life scores (see Table 3.5).

AAS-Marine Life (df=8, F=30.579, R=0.576)	**Unstandardized Coefficients**		**Std.Coefficients Beta**	**t**	**p**
	B	*SE*			
Constant	35.913	2.170		16.552	< 0.001
Reality of limits to growth	0.344	0.153	0.098	2.256	0.024
Anti-anthropocentrism	1.072	0.140	0.339	7.639	< 0.001
Fragility of nature's balance	0.448	0.162	0.127	2.764	0.006
Rejection of exemptionalism	0.314	0.144	0.089	2.188	0.029
Possibility of an eco-crisis	0.436	0.165	0.114	2.637	0.009
Transportation(environment)	1.586	0.548	0.107	2.895	0.004
NGO membership (human)	-2.075	0.840	-0.092	-2.471	0.014
Beach visits purpose (sports)	1.580	0.762	0.077	2.074	0.039

Note: Under stepwise linear regression, each potential variable was added into the multiple regression and tested its correlation with dependent variables until the optimum model was found. Variables that do not fit the optimum model will be removed from the final equation. Therefore, only results from significant predictors are presented here.

Table 3.5 Correlations between environmental concern/environment related behavior and marine life attitude

Further linear regression analyses demonstrated that these factors were also effective, though to varying degrees, in determining the selected AAS-marine life content categories' scores. In Table 3.6, we report the beta coefficient and *t*-values for each content category.

Variables	Stepwise Linear Regression Results (Unstandardized Coefficients *B*/*t* values)			
	Moral Dominance	Food	Medical Research	Hunting/Fishing
	F=47.266, R=0.604	F=21.711, R=0.457	F=15.837, R=0.245	F=13.778, R=0.317
Reality of limits to growth	Removed	-0.187/-4.201	Removed	0.133/4.239
Anti-anthropocentrism	0.521/11.204	0.263/6.040	0.193/5.174	0.103/3.600
Fragility of nature's balance	0.161/3.385	Removed	Removed	Removed
Rejection of exemptionalism	0.124/2.545	0.269/5.713	Removed	Removed
Possibility of an eco-crisis	Removed	Removed	Removed	Removed
Beach frequency (everyday)	-1.434/-2.676	-1.403/-2.704	Removed	Removed
Beach frequency (1-2/week)	Removed	0.532/2.189	Removed	Removed
Beach frequency (1-2/half year)	Removed	Removed	-0.394/-2.186	Removed
Beach frequency (1/year)	Removed	Removed	Removed	0.480/2.202
Beach Purpose (leisure)	-0.493/-2.016	-0.468/-1.971	Removed	Removed
Beach Purpose (sports)	Removed	Removed	Removed	0.499/2.847
NGO membership (human)	-0.603/-2.139	Removed	Removed	Removed

Note: Under stepwise linear regression, each potential variable was added into the multiple regression and tested its correlation with dependent variables until the optimum model was found. Variables that do not fit the optimum model will be removed from the final equation. Therefore, only results from significant predictors are presented here.

Table 3.6 Correlations between environmental concern/environment related behavior and marine life attitude content categories

As illustrated in Tables 3.5 and 3.6, anti-anthropocentrism was the most decisive NEP dimension, in that it has association effects on all four AAS-marine life content categories (all $p < 0.001$). Since anti-anthropocentrism was positively correlated with the selected AAS-marine life content categories' scores, anthropocentrism was negatively related to AAS-marine life scores. The dimension rejection of exemptionalism was positively correlated with the content categories "human moral dominance" and "food". The dimension reality of limits to growth was negatively correlated with the content category "food" but positively correlated with "hunting/fishing". The dimension "fragility of nature's balance" was related to the content category "human moral dominance". In terms of environment-related behavior, frequency of yearly beach visits, purpose of beach visits, and NGO membership were found to be associated with selected AAS-marine life content categories. Among them, frequency of yearly beach visits was a predictor for all four AAS-marine life content categories, although it was not for the total scores of AAS-marine life. Purpose of beach visits were associated with "human moral dominance", "food", and "hunting/fishing" content categories. NGO membership was a predictor only for "human moral dominance".

3.4 Discussion

The results from our survey provide a general image of environmental perceptions as well as marine life attitudes in contemporary Chinese society. In particular, this study revealed that both environmental concern and certain environment-related behaviors are closely correlated with public attitudes toward marine life in coastal China. Moreover, the results draw attention to the crucial role of anthropocentrism in this human–marine life relationship.

3.4.1 Environmental Concerns in Coastal Chinese Society

This study confirms the results from earlier studies (He et al., 2011; Stalley & Yang, 2006) that the Chinese hold positive attitudes toward the environment. Given that the average NEP score (53.83 ± 6.78) was higher than the boundary line (45) and that nearly 90% of our respondents were supportive of a pro-ecological worldview, it is apparent that in coastal China, the public are deeply concerned about the environment. This is not surprising, given that traditional Chinese culture values the environment and praises harmony between humans and nature.

"Tian Ren He Yi", which stands for the conflict and unity between human and nature, is at the core of classical Chinese philosophy (Yü, 2016). "Ren" means human beings or human society; "Tian" literally means the sky but fundamentally incorporates a larger meaning, including "the oneness of heaven, earth, and the myriad things" (Weber, 2005). This signifies the pursuit of human-nature unity and obedience to nature's rules. It set the standards for ancient Chinese on how to position themselves in the relationship between human and nature. Many ancient Chinese philosophers, such as Zhuang Zi, Xun Zi, and Dong Zhongshu, have articulated such thoughts on human-nature harmony (Yü, 2016). Flowers, grass, and trees are all recognised as living organisms, and all lives matter in the philosophical classics. As a result, environmental conservation is embedded within Chinese social norms and remains a mainstream philosophy in Chinese society. Immersed in this cultural atmosphere, Chinese people tend to be positive toward nature and thus feel more anxious about ecological degradation.

Although Chinese society has good awareness of environmental conservation, our results suggest that coastal Chinese citizens are passive regarding participation in environmental preservation. Only 15.6% of the respondents engage in or donate to organisations involved in natural environment conservation. About 70% of the respondents never or rarely follow news reports about clean energy. Although for 35.8% of the respondents, environmental issues (i.e., waste gas emissions and climate change) are their biggest concern when choosing transportation means (except for necessity factors), this percentage is approximately equivalent to those selecting economic factors (i.e., oil price, ticket fee; 31.8%) and personal preferences (i.e., privacy needs, showing social status; 32.2%).

The unique situation of Chinese environmental governance may play a major role here. For the past few decades, environmental governance in mainland China has been relatively closed and

top-down (He et al., 2012). This ensures strong governmental management but largely prevents environmental NGOs and residential communities from participating in and contributing to environmental conservation. This is problematic for the public image building of these environmental NGOs and residential communities. It is highly likely that the public is not familiar with them despite their environmental efforts, and average citizens have limited opportunities to participate in environmental protection, as existing channels (environmental NGOs and communities) do not work properly. Furthermore, respondents in some studies expressed that "it is the government's problem" (Harris, 2006), and consider themselves less obliged to take part in environmental activities.

An interesting finding is the relatively weak "rejection of exemptionalism", despite the fact that our participants felt highly concerned about all five facets of the NEP. This is in line with results by Jing Liu et al. (2010). Coastal Chinese residents somewhat disagreed with the view that human beings are subject to the laws of nature, and did not feel that human ingenuity should act in compliance with nature. To some extent, Chinese residents still held the opinion that human creativity was powerful enough to deal with the constraints of nature. In fact, the idea of human exemption has historical roots in Chinese society. As mentioned previously, the dialectical unity of humans and nature is the gist of classical Chinese philosophy. Human-nature harmony only represents one side of this philosophy. On the other side of this coin lies the respect and praise of human control and interference of the natural world to benefit themselves (Xinzhong, 2014). It is widely accepted in Chinese society that human beings, as intelligent creatures, are capable of overcoming natural obstacles and laws. This public consensus intensified in China in the late 1950s in China. During the "Great Leap Forward" era, "humans must conquer nature" quickly became the prevailing belief, as the central authority propagandised it to direct industrialisation (Shapiro, 2001). Human ingenuity was exaggerated and encouraged to challenge the laws of nature. Although modern day Chinese citizens hold much more rational environmental opinions, as this study shows, the impacts of the view of omnipotent human ingenuity are far-reaching. Human exemptionalism is somewhat consented to in Chinese society.

The present study also confirms what has been illustrated in previous research: that several demographical differences exist in public environmental concern. Compared with men, for example, Chinese women appear to have more awareness of environmental protection. Gender differences in environmental concerns have also been observed and explained in different countries around the world (Jefferson et al., 2014; Mostafa, 2007; Schahn & Holzer, 1990; Xiao & McCright, 2012). As some researchers have pointed out, this might be because women are more likely than men to see the world holistically and link the environment to the things they appreciate (Stern et al., 1993). Our analysis indicates that residents from South China are more concerned about the environment than those in North China. This is probably due to the different physiographic conditions in southern and northern China. Geographically, North China is mostly composed of plains, which enable individuals to make full use of the environment,

while South China is full of hills, which has made human activities somewhat difficult in the past. Such different geographical situations might initiate a desire to transform the environment in North China and coexist with the environment in South China.

Contrary to other studies (Hamilton, 1985; Jones & Dunlap, 1992), our dataset offered no evidence that public environmental concerns depend upon age. The reasons behind this may be multifaceted. The continuity of Chinese culture is likely to contribute the most to this insignificant age difference. As previously discussed, more than 2,000 years ago, ancient Chinese established the faith of "Tian Ren He Yi" to help position themselves in the interaction between human and nature. Chinese culture is renowned for its long continuity and stability. Despite some historical incidents, such as "The Great Leap Forward" temporarily changing public attitudes toward the environment, the basic environmental philosophy of "Tian Ren He Yi" has not radically shifted. Senior and young people live in the same cultural atmosphere and rely on the same environmental philosophy to understand nature.

3.4.2 Correlations between Environmental Concern and Marine Life Attitudes

This research reveals unique links between environmental concern and public attitudes toward marine life and marine life usage in coastal Chinese society. The five dimensions of environmental concern all served as predictors and were positively correlated with public attitudes toward marine life. Four dimensions were associated with the selected marine life content categories.

Two of the five dimensions within the New Ecological Paradigm, "anti-anthropocentrism" and "rejection of exemptionalism", both stand for the refusal of human domination of the world. Jointly, these two facets demonstrate that the human domination concept is negatively correlated with public attitudes toward marine life. In other words, the more people believed in the "world ruler" identity of human beings, the less positive they were toward marine life protection and different marine life usage. Individuals who view themselves as world rulers take for granted that marine life can be utilised for whatever they want. People who do not consider themselves superior to other living creatures are likely to have a more positive attitude toward marine life protection. As previously explained, the "Tian Ren He Yi" belief in traditional Chinese philosophy may account for desirable attitudes toward environmental conservation. It may also apply to the protection of marine life. Marine life is a part of nature and is integrated into the meaning of "Tian" in "Tian Ren He Yi". Since this philosophical principle underscores the harmony between "Tian" and "Ren", the balance between human society and marine life is undoubtably incorporated in its meaning as well.

Apart from traditional philosophy, an alternative explanation may lie in the moral orientation of Chinese people. Current academic research shows that ethical relativism is negatively related to public attitudes toward animals in China (Su & Martens, 2017). Ethical relativism represents the

degree to which individuals reject universal moral principles when making moral decisions (Forsyth, 1980). That is to say, public perception of marine life is determined by how people evaluate their personal needs as well as the context of their specific circumstances. As their appreciation of personal needs increases, they care less about marine life conservation. This moral orientation implies a human-centred outlook when recognising marine life and marine life usage. Whether people believe humans dominate the world directs how they look at marine life and marine life use.

Two other facets of the NEP, "reality of limits to growth" and "fragility of nature's balance", are both associated with the recognition of moderation in environmental reform and development. They denote that the exploitation of environmental resources ought to be handled in moderation simply because limits do exist. Following the same correlation, the recognition of moderation was positively interrelated with public attitudes toward marine life. The more individuals endorse a moderate development view, the more aware they are of marine life and marine life use. Historically, respect for limits originates in Confucianism. Thousands of years ago, Confucian philosophers proposed the ideas of "Zhong Yong" and "Guo You Bu Ji", both meaning that moderation is the most ideal state, since too much is as bad as too little (Ni, 2017). Guided by this Confucian norm, the Chinese tend to believe that being aware of the limits to environmental resource exploitation and economic development is imperative. In the marine area, fish and marine biodiversity resources are extremely valuable to human society. However, overfishing and marine pollution are continually threatening the boundaries of these biological resources. Chinese, who are inclined to moderation, find that unacceptable. The public in China is concerned about marine bioresources, including marine life, since exceeding ecological boundaries violates their social norms of moderation.

The last dimension, "possibility of an eco-crisis", symbolises awareness of potential environmental catastrophes. The positive connection between this facet and attitude toward marine life accentuates the significance of environmental risk perception. For the Chinese, the more aware they are of potential environmental disasters, the more positive their attitudes toward marine life and marine life protection. Such a linkage may also have natural and social grounds in Chinese society. China is a country that has often suffered from natural disasters, such as floods, droughts, and marine disasters (Zhang et al., 2002). In the past, catastrophic impacts have occurred on the marine environment and marine life in mainland China. A report from the Chinese Ministry of Natural Resources shows that in 2018, roughly 16 storm surges hit coastal areas, which led to a direct economic loss (including fishery loss) of CNY 4.5 billion (MNR, 2019). Though marine natural disasters are certainly damaging, some man-made disasters can be more devastating, such as the Penglai 19-3 oil spill event. The largest marine oil spill that ever occurred in China resulted in polluted water of 840 km^2 in the first 15 days (Liu, Guo, et al., 2015) and short-term fishery loss of CNY 1256.35 million in one of the affected cities alone (Pan et al., 2015). The marine life loss and food safety problems caused by these maritime calamities are by no means negligible.

Another change normally generated by maritime disasters is in public attitudes. Environmental disasters usually exacerbate public attitudes and trigger concerns about environmental issues (Su et al., 2015; Walters et al., 2014). For instance, after the occurrence of the Fukushima nuclear disaster, public attitudes in China toward nuclear power projects dramatically and promptly became unsupportive (Huang et al., 2013). Fears over nuclear radiation reaching China and rumours about the radiation preventing effects of iodized salt triggered a frenzy of salt buying and hoarding in several mainland cities (Freyeisen, 2011). It is plausible that the severe situation of marine disasters, together with their destructive power, amplifies public concern about marine life in coastal China.

A further aim of this study was to investigate how environmental concern links to public attitudes toward different marine life usage. Our results demonstrate that environmental concern, particularly the anti-anthropocentrism dimension, was crucial to all four marine life content categories. “Anti-anthropocentrism” and “rejection of exemptionalism” both had association effects on the “human moral dominance” category. The idea that humans dominate the world is positively linked to the idea that humans dominate marine life. Given the fact that this idea signifies a “world ruler” standpoint, it also justifies taking control of marine life. Likewise, these two facets were positively correlated with the content category “food”. The idea of human domination facilitates the justification of consuming marine life.

With respect to medical research use and hunting/fishing of marine life, we confirmed that anthropocentrism is associated with public perception. A number of former studies have brought to light the comparatively accepting attitude of the Chinese toward animal use in scientific research (Su & Martens, 2017). Here we provide a possible motive for this special tolerance: anthropocentrism. Anthropocentrism implies that the nonhuman natural world is subordinate to human needs (Hoffman & Sandelands, 2005). The progress of science and medicine is one of those human needs and requires the sacrifice of animals, including marine life. It is logical that individuals who embrace anthropocentrism accept laboratory use of marine life. Facet “reality of limits to growth” is instrumental to the content categories “hunting/fishing” and “food”, indicating that the recognition of moderation is also decisive in shaping citizens’ awareness. The anthropocentric worldview and the recognition of moderation jointly contribute to coastal citizens’ understanding of utilising marine life for food. The more people object to the “world ruler” identity and realise the limits of fishery resources, the more concerned they are about consuming marine life.

3.4.3 Correlations between Environment-Related Behavior and Marine Life Attitudes

There is growing evidence that some environment-related behavior is related to the perception of animals, such as meat consumption (De Backer & Hudders, 2015), donation preferences (Su & Martens, 2017), and animal rights activism (Galvin & Herzog, 1992). Nevertheless, it remains

unclear whether this applies to the interaction between humans and marine life as well. The current study validates the linkage between environment-related behavior and public attitudes toward marine life and shows that beach visits, NGO membership/donations, and transportation preferences are three important predictors of marine life attitudes.

Both frequency and purpose of beach visits were indicators of public attitudes toward marine life or marine life use. Individuals who visited the beach multiple times a year showed less concern about marine life protection than those who visited it only once a year or less. People who visited the beach for sports were more positive toward marine life protection and concerned about hunting/fishing marine life. Considering fishing is a beach sport and marine life is prey, a better awareness of marine life protection might simply arise from the need for a better sporting experience. Beach visits frequency and purpose demonstrate that contact with nature is connected to citizens' attitudes toward marine life.

Transport selection varied significantly between different people. The present study showed that when necessity factors (time limits, speed, etc.) were ruled out, individuals who were motivated by protecting the environment (waste gas emissions, climate change, etc.) for making transport decisions expressed more concern than those with other motives (economic factor, personal preference, others) for marine life protection. This provides additional evidence that environmental concern is positively correlated with public attitudes toward marine life and different marine life use. Interestingly, membership/donation of neither animal welfare nor environmental conservation organisations made a difference in marine life attitude, while membership of human health/rights organisations did. Actually, the interest of involving in or the behavior of donating to human health/rights organisations already signifies a somewhat anthropocentric idea. These members' less positive attitudes toward marine life indirectly demonstrate the role of anthropocentrism in modelling human–marine life interaction.

3.5 Conclusions and Limitations

The present study found that environmental concern is positively correlated with public attitudes toward marine life in coastal China. The more individuals support an ecological worldview, the more positive they are toward marine life protection; the more people hold an anthropocentric worldview, the less friendly they are to marine life use. Human domination, the recognition of moderation, and environmental risk perception are three important notions in shaping public awareness of marine life protection. Furthermore, some environment-related behaviors, such as beach visits, transportation preferences, and NGO membership/donation are significant indicators of public attitudes toward marine life. In particular, anthropocentrism and beach visits are two key predictors not only of marine life protection, but also of four selected marine life content categories (human moral dominance, food, medical research, and hunting/fishing).

The findings from this research enrich the ongoing discussion about sustainable human–animal relationships and give rise to reflection on modern marine life conservation and governance. However, our results should be interpreted with caution as we did not have a balanced sample. The limited samples from coastal rural areas and the elderly may be responsible for why we did not find age and urban–rural differences, even though urban–rural disparity is one of the unique features of modern Chinese society (Liu et al., 2017). In addition, as this study was not designed to explore the causality between attitude and behavior, it is not possible to draw absolute conclusions regarding environmental behavior and marine life attitudes. The correlations we uncovered here do not indicate causation. We recommend that future research focus on advanced inquiries into the links between environment-related behavior and attitudes toward marine life.

Endnotes

[1] They are Dalian, Yingkou, Qinhuangdao, Tianjin, Yantai, Weihai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Xiamen, Shantou, Guangzhou, Shenzhen, Zhuhai, Zhanjiang, Beihai, Haikou and Sanya.

[2] See different documents from State Council of the People's Republic of China in 1979, 1980, 1981, 1984, 1985, 1988.

4

Chapter 4

Coastal Residents' Attitudes Toward Offshore Oil and Gas Drilling in China

Abstract
This chapter reports findings from research which surveyed coastal residents' attitudes toward offshore oil and gas drilling in China. An online survey was carried out in 22 coastal Chinese cities using a questionnaire aimed at collecting demographic information and measuring offshore drilling support, risk, and trust. The data reveal that coastal residents hold a low support, high risk-perception, and moderate trust over offshore oil and gas drilling. NIMBY (Not-In-My-Back-Yard) mentality shows up in citizens' support towards offshore drilling. Coastal residents hold different levels of confidence in offshore drilling claims, based on source and contents. People tend to trust scientific statements more from environmental groups than from the oil industry and have more trust in information according to which offshore drilling is riskier instead of safer than previously anticipated. In addition, demographic differences were captured on support for and trust in offshore oil and gas drilling. Gender, occupation, religious attitude, and dietary habits are uncovered to be predictors of offshore drilling support.

Keywords
Offshore Drilling; Human Attitude; China; NIMBY; Trust

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4.1 Introduction

Offshore oil and gas drilling provides societies with billions of dollars in profit, employs millions of people, and offers substantial tax income for governments (Mukherjee & Rahman, 2016; Taleghani & Tyagi, 2017). However, the sector simultaneously poses substantial risks of polluting the marine environment and threatening marine biodiversity (Kirkwood & Matura-Shepherd, 2011; Mukherjee & Rahman, 2016). Therefore, decisions about offshore drilling such as where to drill, how to operate, and who is qualified to drill create huge social controversies (Haavik, 2012; Smith & Garcia, 1995). Knowledge of human attitudes toward offshore drilling is of vital importance for making considered judgments and formulating long-term energy development strategies for both governments and the energy industry (Flin & Mearns, 1994; Mukherjee & Rahman, 2016; Smith & Garcia, 1995).

Current literature on citizens' attitudes toward offshore drilling mostly centers on three research themes. The first theme is public support to offshore drilling (Freudenburg & Gramling, 1993; Gramling & Freudenburg, 2006). This support has been found to be dependent on location. In the United States, offshore drilling is moderately accepted, more than other energy utilization methods such as hydraulic fracturing (Ceccoli, 2018; Lilley & Firestone, 2013; Mukherjee & Rahman, 2016). Studies of Southwest England have also uncovered more positive attitudes toward offshore oil drilling than toward nuclear energy (Eiser et al., 1988; Eiser et al., 1989). However, other research finds less favorable attitudes. Acceptance of offshore drilling among residents of coastal California has sharply declined since 1980 (Freudenburg & Gramling, 1993; Michaud et al., 2008; Smith & Garcia, 1995). Residents of the Canary Islands have also expressed a similarly low acceptance of offshore drilling (Ruiz et al., 2018). Public support for offshore drilling has been found to be relatively stable over time. Large-scale environmental accidents, such as the Gulf of Mexico oil spill (2010), have no influence or merely transient influence on public acceptance of offshore drilling (Bishop, 2014; Lilley & Firestone, 2013; Mukherjee & Rahman, 2016). Other driving factors behind this public support include political ideology (Ceccoli, 2018; Lilley & Firestone, 2013), economic considerations (Mukherjee & Rahman, 2016; Ruiz et al., 2018), and basic demographics such as education (Freudenburg & Gramling, 1993; Smith & Garcia, 1995), age (Ceccoli, 2018; Mukherjee & Rahman, 2016), and gender (Michaud et al., 2008).

Some researchers have explored 'not in my back yard' (NIMBY) mentality concerning offshore drilling projects. NIMBY mentality refers to opposition from local communities to projects that are deemed to be necessary, but that are unwanted in one's own vicinity (Burningham et al., 2006; Dear, 1992). Several scholars support the position that proximity can influence public support of offshore drilling (Freudenburg & Gramling, 1993), while others reject this NIMBYism effect (Michaud et al., 2008; Smith & Garcia, 1995). In recent years, many social scientists have cast doubts on whether NIMBYism could encompass the motives of local opposition and adequately represent the multidimensional human perception (Bell et al., 2005; Devine-Wright, 2013; Wolsink, 2000, 2006). Alternatively, "place attachment" and "place protective action"

have been proposed to conceptualize this public opinion and to address the site selection problem this public attitude reflects (Devine-Wright, 2009; Petrova, 2013). NIMBY concept is employed in the present study because it sufficiently describes the attitude difference related to proximity and public acceptance in the social context (Carley et al., 2020; Konisky et al., 2020; Lindén et al., 2015) and it analyzes the significance that vicinity to offshore oil and gas drilling has in coastal China.

The second research theme of citizens' attitudes toward offshore drilling is the risk perception of offshore oil and gas drilling among the public. Most literature in this theme focuses on investigating the risk perception of offshore drilling personnel (Rundmo, 1992; Sætren & Laumann, 2015), while some examine other social groups such as students (Mullet et al., 1998) and coastal residents (Michaud et al., 2008). People from different social groups largely possess a similar awareness of the fact that offshore drilling is highly risky (Michaud et al., 2008; Mullet et al., 1998; Ruiz et al., 2018). Offshore drilling operations and drilling impacts are often cited as two chief concerns. Offshore drilling crews recognize drilling operations, particularly the safety of facilities and accident-controlling systems, as the riskiest aspect (Rundmo et al., 1998). The same opinion is true for the spouses of offshore drilling workers (Parkes et al., 2005). Coastal residents identify the environmental impacts of offshore drilling as the main threat including the pollution of the marine environment, the possibility of a serious disaster, and the health risks to local citizens (Eiser et al., 1988; Michaud et al., 2008). University students also feel highly concerned over the health and environmental risks attached to oil and gas, as a previous study in Belgium and France uncovers (Mullet et al., 1998). Although some public risk perceptions may not be supported by scientific risk assessment (Michaud et al., 2008), they still signify public concerns regarding the risks associated with offshore drilling.

The third research theme is public trust in the source and content of information about offshore drilling (Carlisle et al., 2010; Conchie & Donald, 2006; Michaud et al., 2008). Existing literature shows that individuals have more confidence in information that offshore drilling is riskier rather than safer than they anticipated (Carlisle et al., 2010). This is congruent with the aforementioned high risks perceived by the public. Depending on the content, citizens will decide whether to trust the source and accept scientific claims as true (Carlisle et al., 2010; Michaud et al., 2008). For instance, Carlisle et al. (2010) demonstrate that for claims of offshore drilling being safer than anticipated, the public has more trust in environmental groups than the oil industry. To that end, personal political inclination and cultural values are significant in building individuals' trust in offshore drilling statements (Carlisle et al., 2010; Michaud et al., 2008).

In China, oil and gas account for a combined 27.4% of total energy consumption, with annual growth rates of 5% and 18% respectively (BP, 2019). Offshore oil and gas drilling in China began modestly in the 1980s but became well-developed in both exploitation and production within decades (Weilin et al., 2016; Yuhong, 2018). Experts estimate that considerable oil and gas resources are reserved at the Chinese coasts and the South China Sea, a large share of which

still remains untouched (Chen, 2011; Weilin et al., 2016). Despite the increasing magnitude of offshore oil and gas drilling in China, no research has been conducted that examines the attitudes of the Chinese citizens toward offshore drilling. In particular, there is no information about how coastal residents understand offshore oil and gas drilling in China. The public attitudes of Chinese coastal communities deserve scientific attention because not only do coastal communities directly benefit economically from offshore drilling but the environmental risks and their potentially disastrous impact on local residents, such as those caused by the Penglai 19-3 oil spill (2011), are valid concerns.

Some previous research has probed public attitudes about issues related to offshore drilling. An earlier study among tourists in the Bohai Bay city of Yantai found that Chinese households feel deeply concerned over the oil spills and their subsequent damage to coastal resources, especially the environment and marine life (Liu et al., 2016). According to research about Chinese public attitudes toward nuclear power, the public generally considers environmental NGOs and nuclear power companies to have equal levels of trustworthiness (He et al., 2014). In contrast, more research has been conducted on NIMBYism effect in China. Research has studied how NIMBY protests are triggered, continued, and stopped, and those studies linked the protests to public policing and legislation development (Gu, 2016; Johnson, 2010; Wu & Dai, 2014). NIMBY mentality has been observed in local attitudes toward various energy forms like wind power (Guo et al., 2015), incineration power (Huang & Yang, 2020; Huang et al., 2015), and nuclear power (Sun & Zhu, 2014). However, these findings are inadequate in depicting a general image of offshore drilling attitudes in China. Now that oil and gas drilling is conducted off the coast, understanding coastal residents' attitudes toward offshore drilling is of vital importance. In comparison, how U.S. residents, particularly Californians, recognize offshore energy development has been well-documented. It remains unknown if any similarities exist between residents of coastal China and coastal California on the topic of offshore drilling.

Given the lack of literature about Chinese attitudes toward offshore oil and gas drilling, and judging by the existing knowledge from research into other countries, this study aims to fill this knowledge gap by answering the following research questions:

1. What attitudes do coastal residents hold regarding offshore oil and gas drilling in China? Especially, how much support do coastal residents in modern Chinese society have for offshore drilling? How much risk associated with offshore drilling do Chinese coastal residents perceive? How much confidence do these residents have in different scientific statements about offshore drilling?

2. Does NIMBY mentality also occur in coastal residents' attitudes toward offshore oil and gas drilling?

3. What is the correlation between human demographics such as age, gender, education, occupation, etc., and coastal residents' attitudes toward offshore oil and gas drilling?

As the first piece of research to investigate attitudes of offshore oil and gas drilling, this study will portray a general image of offshore drilling attitudes in coastal China and will explore the demographic predictors of such attitudes. By assessing coastal residents' support, risk perception, and trust in offshore oil and gas drilling, a sequence of comparisons will be drawn to examine the similarities and differences between coastal Chinese residents and residents of coastal California. This research also serves as the first to associate offshore oil and gas drilling with NIMBY mentality as well as trust difference in China. The intended impact of this study is to increase scientific knowledge regarding coastal citizens' attitudes toward offshore energy development in China.

4.2 Methodology

4.2.1 Survey

Research data came from an online survey that was conducted between September 17th and October 8th, 2018 by Kurundata, a certified data company that has previously supported a series of scientific projects. Previous studies have demonstrated that data collected digitally are as valid as paper-based surveys (Knapp & Kirk, 2003). Twenty-two mainland coastal cities[1] were targeted as research sites to examine offshore drilling attitudes in coastal China. These cities were selected because of their proximity to the coast and each coastal province was represented by at least one city. Some of the chosen cities were even geographically close to existing or planned offshore drilling platforms. More importantly, since the late 1970s, central government policies have defined these cities as "Coastal Opening Cities" or "Special Economic Zones" to promote foreign investment and international trade[2], thus indicating their economic and political significance in modern Chinese society. These advantages make this study's target cities ideal locations to survey coastal Chinese attitudes about offshore drilling. Survey data were collected in the following manner: A stratified random sampling procedure (Acharya et al., 2013) was performed inside Kurundata's database, aimed at residents 18 years old and above in 22 selected cities. Then, an invitation with a hyperlink to the online questionnaire was sent to residents in each city that were randomly selected by the system. Participation in this survey was entirely voluntary. A forward and backward translation procedure (Tsang et al., 2017) was applied while translating the original English questionnaire into Chinese to guarantee reliable comprehensibility and consistency. This study was conducted under protocols approved by Maastricht University's Ethical Review Committee Inner City faculties (reference code ERCIC-238-26-02-2021). In total, 1,459 invitation letters were distributed during the online survey.

4.2.2 Questionnaire

Preceded by an open letter, the questionnaire was composed of two independent sections which separately focused on demographics and attitudes about offshore drilling. The first section contained 20 items relating to respondents' demographic details. Data gathered in this section included age, gender, occupation, educational background, residential location,

religious beliefs, and average household income. In addition, respondents were asked to answer questions concerning their personal habits and environmental behaviors, such as meat consumption, car ownership, beach visiting frequency, oil price and clean energy news consumption. The collection of behavioral information was not only to help depict a full image of our participants but to also examine whether behavioral differences could explain different offshore drilling attitudes.

The second section of the questionnaire consisted of three sets of questions that were designed to elicit respondents' attitudes regarding the support of offshore drilling, the risks associated with offshore drilling, and their trust in statements about offshore drilling. The construction of this section (14 items in total) was based on the three sets of core questions from Michaud et al. (2008) with modifications to suit the Chinese social context. Series A focused on the public support of offshore oil and gas drilling expansion in respondents' current residential city, in remote areas, or in or near National Marine Nature Reservation Areas (NMNRA). Two of these options (support of drilling in respondents' respective residential cities and remote areas) were specifically included to assess NIMBY mentality in coastal Chinese society. Series B addressed the potential oil spills and health risks associated with offshore drilling activities. To improve our understanding of the risk perception of the Chinese, one question was added in this series regarding the threats to marine life posed by large-scale oil spills. Respondents were requested to rate their perception of the frequency of large-scale oil spills, the threats caused by large-scale oil spills to human life as well as marine life, and the chances of getting cancer by being in contact with raw oil. Series C focused on public trust in scientific claims made by both the oil industry and environmental groups. Participants were required to indicate their confidence in three individual statements made by scientists from environmental groups and by the oil industry. The statements were regarding the health risks attached to living near drilling sites, and if modern technology makes drilling safer or riskier. All questions in this section used a four- or five-point Likert scale to indicate attitudes from negative to positive. Higher sum scores denoted higher positivity levels about offshore drilling. Participants were instructed to self-report based on their own judgments. The overall Cronbach's alpha of this section reached 0.813, indicating good reliability of the questions (Taber, 2018). However, since series B obtained relatively lower credibility (Cronbach's alpha = 0.595) than series A (Cronbach's alpha = 0.791) and C (Cronbach's alpha = 0.837), further investigation was not conducted for series B.

4.2.3 Statistical Analysis

The statistical analysis was performed using the scientific software IBM SPSS 25. Given that the data in the present study were not normally distributed and could not be normalized, a string of nonparametric tests was carried out to determine coastal residents' attitudes toward offshore drilling in China. To begin, the descriptive statistics function of SPSS was used to capture some basic attributes of the respondents such as mean age, educational level, and residential location distribution. The public attitudes of offshore drilling were subsequently examined in detail by applying a frequency analysis to each question in the drilling attitude section (support, risk, and trust). Then, a sequence of Wilcoxon Signed-Rank tests was utilized to detect NIMBY

mentality in coastal Chinese society and the trust difference in statements from environmental NGOs and the oil industry. Lastly, depending on different types of variables, the Mann-White U test or the Kruskal-Wallis H test was conducted to identify the correlations between offshore drilling attitude and demographics as well as behavioral preferences. A Bonferroni correction was implemented to reduce type I errors when conducting post hoc tests (Hazel et al., 2011). Since no theoretical evidence supports which variable precedes another, simultaneous linear regression tests were conducted to examine the predictors of offshore drilling attitudes within basic demographic factors. All variables were recoded as dichotomous variables (1-Yes, 0-No) before being adopted into the simultaneous regression tests.

4.3 Results

4.3.1 Basic Information of Respondents

The online survey yielded a sample that consisted of 500 (out of 550) valid responses. Some basic information of survey respondents is shown in Table 4.1. Judging by Table 4.1, participants of this survey research were relatively young (M = 29.63, SD = 7.6) and mostly urban residents. Since the urban-youth constituted the majority of Chinese 'netizens' (CNNIC, 2018), it is not surprising that the majority of respondents to this questionnaire were young people and urban residents. Please note that the statistics in section 4.3.1 coincide with two other unpublished studies that use the same dataset (Chen & Martens, 2022a, 2022b).

Demographics (N=500)	***n* (%)**	**Demographics**	***n* (%)**
Age group		***Average household income/month (X)***	
18-30	322(64.4)	X ⩽2,000 yuan/month	10 (2.0)
31-40	144(28.8)	2,000 yuan/month < X ⩽ 4,000 yuan/month	32 (6.4)
41⩽	34(6.8)	4,000 yuan/month < X ⩽ 6,000 yuan/month	75 (15.0)
Gender		6,000 yuan/month < X ⩽ 8,000 yuan/month	105 (21.0)
Female	295(59)	8, 000 yuan/month < X ⩽ 10, 000	129 (25.8)
Male	205(41)	10, 000 yuan/month < X	143 (28.6)
Educational background		No answer	6 (1.2)
Less than high school	2(0.4)	***Residential location***	
High school	17(3.4)	Urban area	463(92.6)
Junior college program	63(12.6)	Rural area	37(7.4)
University bachelor degree	349(69.8)	***Geographic area (Qingling-huaihe boundary)***	
Master degree and above	69(13.8)	South China	300(60)
Occupation		North China	200(40)
Liberal Profession	36 (7.2)	***Attitude to religion/spirituality***	
Civil Servant/Public Institute	85 (17.0)	Important in life	338 (67.6)
Employee (Enterprises)	273 (54.6)	Not important in life	162 (32.4)
Self-employed	44 (8.8)	***Dietary habit (meat-eating frequency)***	
Retired	2 (0.4)	Vegetarian/Vegan	12 (2.4)
Student	50 (10.0)	Once a week	43 (8.6)

Social Welfare	1 (0.2)	2-3 days a week	100 (20.0)
Other	3 (0.6)	4-6 days a week	237 (47.4)
No Answer	6 (1.2)	Everyday	108 (21.6)

Table 4.1 Basic information of respondents

4.3.2 Public Attitudes Toward Offshore Drilling

Overall, the survey's respondents expressed low support, high-risk perception, and moderate confidence in offshore oil and gas drilling in coastal Chinese society.

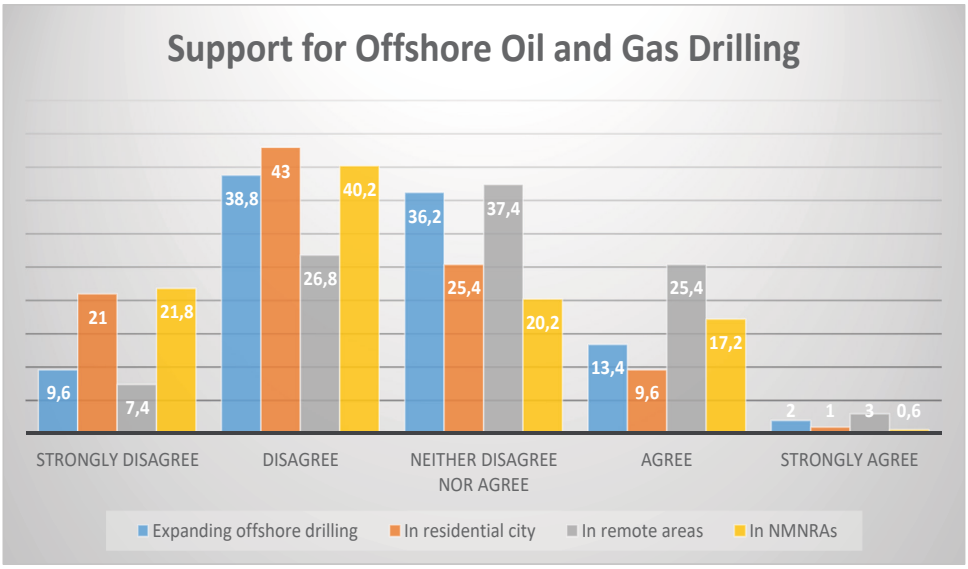

Figure 4.1 Coastal residents' support for offshore oil and gas drilling

Responses from participants revealed that coastal citizens' support for offshore oil and gas drilling was quite low. The mean and median of each question in series A were 2.59/3 (expanding offshore drilling), 2.27/2 (drilling in respondents' current residential city), 2.9/3 (drilling in remote areas), and 2.35/2 (drilling in or near National Marine Nature Reservation Areas). The average answers to all four questions fell into the range of 2 (disagree) to 3 (neither agree nor disagree). Figure 4.1 summarizes responses to the questions in series A questions (shown in percentage). As Figure 4.1 displays, there were more disapproval rates (strongly disagree and disagree) than approval rates (strongly agree and agree) on all four supporting issues targeted in this research. Among these topics, drilling in respondents' current residential city attained the highest level of disapproval (64%). A similar level of disapproval (62%) was associated with drilling in or near National Marine Nature Reservation Areas. Nearly half of the answers (48.4%) in response to questions about expanding offshore drilling in Chinese coastal areas were negative. About one-third of respondents (34.2%) were opposed to drilling in remote areas. In striking contrast, the most support for offshore drilling was associated with

drilling in remote areas (28.4%), followed by drilling in/near NMNRAs (17.8%), expanding offshore drilling in Chinese coastal areas (15.4%), and drilling in respondents' current residential city (10.6%). In addition, the medians of drilling in respondents' current residential city and in or near NMNRAs were both within 2 (disagree), while the medians of expanding offshore drilling and drilling in remote areas were both 3 (neither agree nor disagree). This indicated that the public is in stronger objection to drilling in their current residential city and in or near NMNRAs than expanding offshore drilling and drilling in remote areas.

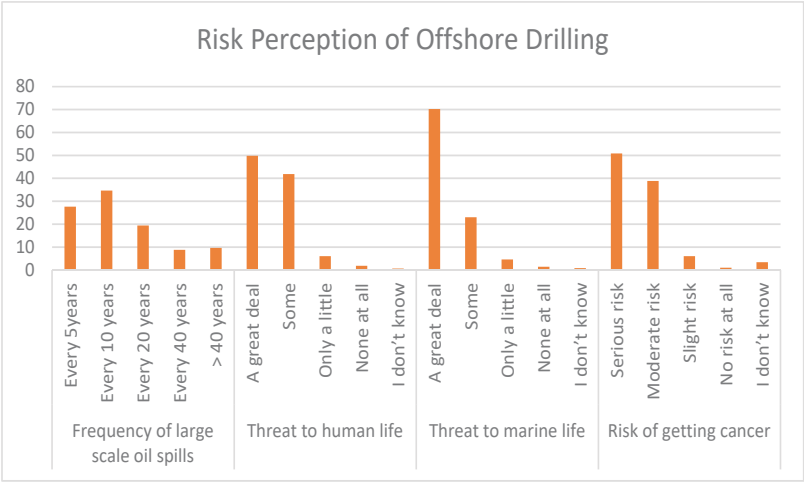

Figure 4.2 Coastal residents' perception of risks associated with offshore oil and gas drilling

Data analysis also discovered that the risks associated with offshore oil and gas drilling were of deep concern to survey respondents. The mean and median of each question in series B were 2.38/2 (frequency of large-scale oil spills), 1.62/2 (threat to human life), 1.40/1 (threat to marine life), and 1.67/1 (risks of getting cancer). Nearly all the means and medians were in the range between 1 (serious risk) and 2 (moderate risk), implying strong negative feelings to the issues questioned in this series. Figure 4.2 lists the results of participants' risk perception of offshore oil and gas drilling in China (shown in percentage). Over 60% of respondents (62.2%) felt that large-scale oil spills happened less than every ten years. Approximately half of the respondents felt that large-scale oil spill events would pose "a great deal" of threat to human life (49.8%) and that contact with unrefined oil would create a "serious risk" of getting cancer (50.8%). Seventy percent of respondents believed that large-scale oil spills could bring about "a great deal" of threat to marine life.

However, scientific assessments of oil spill risks do not fully correlate with respondents' perceptions. Large-scale oil spill events caused by drilling platforms in Chinese coastal areas have occurred very rarely in recent history. For example, although 13 large marine oil spill events (>1000t spilled oil) have occurred off the coasts of China between 1971 and 2011, the majority of these spills were caused by tanker collisions, rather than offshore drilling (Gong et

al., 2018). Regarding the threat of health risks, despite updated scientific research that has exposed the physical and psychological impacts that oil spills and cleanup operations may have on human life, there is no sufficient evidence to support the high risk of getting cancer or another lethal illness from coming into contact with raw oil (Aguilera et al., 2010; Laffon et al., 2016).

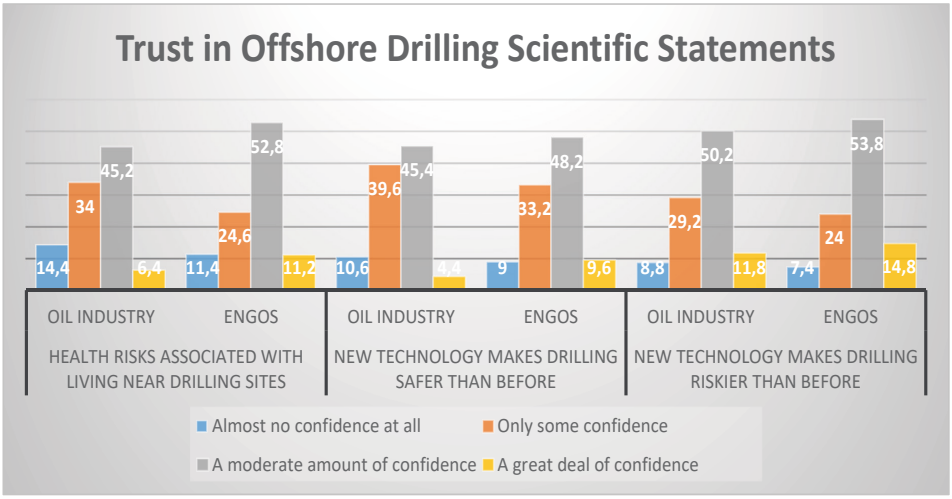

Figure 4.3 Coastal residents' trust in scientific statements regarding offshore oil and gas drilling

In terms of confidence in scientific claims about offshore oil and gas drilling, respondents to this survey displayed moderate trust toward these statements. The mean and median of each question in this section are shown in Table 2 (comparisons 2–4). All mean and median figures were located in the range of 2 (some confidence) to 3 (a moderate amount of confidence). Considering that questions in series C were designed on a 4-point Likert scale, this range represents a reasonable confidence in scientific claims. Figure 4.3 presents the results of coastal citizens' confidence in different scientific statements about offshore drilling (shown in percentage). As this diagram indicates, respondents provided more responses of "almost no confidence at all" and "only some confidence," and less responses of "a moderate amount of confidence" and "a great deal of confidence" on each statement from the oil industry than they did on statements from environmental groups. Regardless of the statement's source, more responses of "a moderate amount of confidence" and "a great deal of confidence" and less responses of "almost no confidence at all" and "only some confidence" were given to "new technology makes drilling riskier than before" than the safer equivalent statement. In addition, "a moderate amount of confidence" was the most favored reply given by survey respondents for all six statements.

4.3.3 Support and Trust Difference in Offshore Drilling Attitudes

Throughout the descriptive analyses, many differences in public attitudes toward offshore drilling were identified, particularly in the support of different drilling locations and confidence in different scientific claims. A series of Wilcoxon Signed-Rank tests were performed to determine if these differences were statistically significant. Table 4.2 displays these tests' results regarding the support of different drilling locations and confidence in different scientific claims.

Comparison		Mean	*SD*	Median	*Z* value	Sig (2-tailed)
1	Drilling in residential city	2.27	0.93	2	-13.352	$p < .001$
	Drilling in remote areas	2.90	0.96	3		
2	Health risks on living near drilling sites from oil industry	2.44	0.81	3	-7.122	$p < .001$
	Health risks on living near drilling sites from ENGOs	2.64	0.83	3		
3	New tech makes drilling safer than before from oil industry	2.44	0.74	2	-4.603	$p < .001$
	New tech makes drilling safer than before from ENGOs	2.58	0.79	3		
4	New tech makes drilling riskier than before from oil industry	2.65	0.80	3	-3.310	$p = .001$
	New tech makes drilling riskier than before from ENGOs	2.76	0.79	3		
5	New tech makes drilling safer than before from oil industry	2.44	0.74	2	-5.910	$p < .001$
	New tech makes drilling riskier than before from oil industry	2.65	0.80	3		
6	New tech makes drilling safer than before from ENGOs	2.58	0.79	3	-4.635	$p < .001$
	New tech makes drilling riskier than before from ENGOs	2.76	0.79	3		

Note: All *p* values in the table represent asymptotic significances.

Table 4.2 Test results of support and trust differences in offshore drilling attitudes

As Table 4.2 shows, participants rated "drilling in residential city" significantly lower than "drilling in remote areas," indicating a more negative attitude toward drilling in their respective residential cities than in remote areas. Such negative feelings are strong evidence of the existence of NIMBY mentality on offshore drilling in coastal Chinese society. Test outcomes also proved that respondents' trust differences regarding scientific claims were statistically meaningful according to both source and content. Our respondents rated the validity of all three statements made by the oil industry significantly lower than statements made by environmental groups. Likewise, respondents graded all three claims that implied offshore drilling was risky significantly lower than claims that implied offshore drilling was safe.

4.3.4 Demographic Differences and Predictors of Offshore Drilling Attitude

The next step of this study was to investigate the correlation between demographics and coastal residents' attitudes about offshore drilling. Before that, we examined if there were any demographic differences in offshore drilling attitudes. Table 4.3 shows the results of the Mann-Whitney U tests and the Kruskal-Wallis H tests that were performed on each series of questions. As indicated in Table 4.3, male respondents and respondents who believe religion/spirituality is important in life scored significantly higher than female respondents and people who believe religion/spirituality is not important in life. On the topic of confidence in scientific claims, vegetarians/vegans scored significantly lower than people who eat meat daily. Nevertheless, no

significant differences were detected regarding respondents' city of residence, education level, occupation, or household income for offshore drilling support or trust scores.

Demographics	Series	Comparison	Mean	SD	Test Results
Gender	*Support*	Male	10.56	2.88	*U* (205,295) = 25782.500, *Z* = -2.820, *p* = .005
		Female	9.79	3.06	
Religion/Spirituality Attitude	*Support*	Important	10.35	3.12	*U* (338,162) = 23007.500, *Z* = -2.907, *p* = .004
		Not Important	9.59	2.68	
Dietary habit – Meat consumption	*Trust*	Vegetarians/vegans	12.17	5.06	*H* (4) =12.495, *p* = .014, Post-hoc *p* = .045
		Everyday	16.27	3.15	

Note: All *p* values in the table represent asymptotic significances.

Table 4.3 Demographic differences on offshore drilling attitudes

This analysis further explored the predictors of offshore drilling attitude scores according to eight demographic factors. A simultaneous linear regression test uncovered that gender, occupation, religious attitude, and dietary habit are predictors of offshore drilling support scores. However, the correlation between demographic factors and offshore drilling risk as well as trust scores were both rejected by multiple linear regression tests (both $p > .05$). The results of these multiple linear regression tests are reported in Table 4.4 (only significant correlations are listed).

Offshore Drilling Support (df=48, F=1.455, R=0.366)	**Unstandardized Coefficients**		**Std.Coefficients**	***t***	***p***
	B	*SD Error*	**Beta**		
Constant	9.999	0.861		11.615	<.001
Gender (female)	-0.632	0.296	-0.104	-2.133	.033
Occupation (self-employed)	1.288	0.521	0.122	2.474	.014
Religion/Spirituality (important)	1.017	0.316	0.159	3.221	.001
Dietary habit (vegetarian/vegan)	-2.292	0.915	-0.117	-2.505	.013

Table 4.4 Predictors of offshore drilling support

4.4 Discussion

The present study aims to portray a general image of coastal residents' attitudes toward offshore oil and gas drilling in China. The results of the survey reveal that citizens maintain relatively negative perceptions of offshore oil and gas drilling in coastal China and that NIMBYism and trust differences do exist in their attitudes. In addition, some basic demographics, such as gender, occupation, religious attitudes, and dietary habit, are predictors of coastal residents' support for offshore oil and gas drilling.

4.4.1 Offshore Drilling Attitude in Coastal Chinese Society

This study determines that support for offshore oil and gas drilling in coastal Chinese society remains at a low level. Coastal residents' limited support is unvarying according to different drilling locations or an increase in future offshore drilling. As a potential result of this attitude, it would come as no surprise if future offshore drilling projects along Chinese coasts encounter civic protests. In fact, it is not difficult to comprehend why coastal residents are reluctant to

support offshore oil and gas drilling in China. On one hand, traditional Chinese culture favors the harmonious coexistence of human beings and the environment. Confucianism promotes the concept of "tianren heyi," which refers to harmony between human society and nature (Xinzhong, 2014). Taoism promotes a "wuwei" philosophy, which has no tolerance for human action that is against the laws of nature (Waistel, 2012). As two cornerstones of traditional Chinese culture, Confucianism and Taoism deeply ingrain an environmental-friendly belief in the Chinese mindset. Offshore drilling will alter the appearance of nature and jeopardize the balance of the marine ecosystem, therefore contradicting the Chinese ideal of harmonious coexistence. On the other hand, past maritime disasters may have significantly decreased public support for offshore drilling (Lilley & Firestone, 2013; Smith & Garcia, 1995). This study considers that the limited support of coastal communities may result from a maritime disaster that happened in 2011: the Penglai 19-3 oil spill. This accident is the most serious offshore oil spill in China to date, contaminating 840 km^2 of water as well as causing a catastrophic economic loss in aquaculture (Liu, Meng, et al., 2015). Likewise, continuous marine disasters from abroad, such as the Gulf of Mexico oil spill (2010) and Fukushima Daiichi nuclear accident (2011), may further deteriorate coastal residents' already weak support of offshore drilling.

Throughout the data, a strong trend of risk perception regarding offshore drilling from the respondents was witnessed. As previously mentioned, coastal residents maintain deep concerns about the frequency and severity of offshore oil spills caused by drilling operations, even though this perception may be scientifically unfounded. A huge gap currently exists between the perceived risks associated with offshore drilling and the actual situation. When the results of this study were compared with the results of the California study (Michaud et al., 2008), both similarities and dissimilarities regarding coastal citizens' risk perception were uncovered. Similar to coastal Chinese residents, respondents in the coastal California study were also apt to overstate the potential risks associated with offshore drilling. For example, 68% of respondents believed that oil spills posed "a great deal of" or "some" threat to human life. Fifty-two percent of those surveyed believed that contact with unrefined oil poses a "serious" or "moderate" risk of getting cancer. When the values of these percentages are compared between the two studies, offshore drilling risks were much more exaggerated by coastal Chinese residents than their Californian equivalents. An interesting finding of this comparison was that coastal Chinese residents' deep concerns about the potential risks of offshore drilling incorporate impacts on both human health and the living conditions of marine life.

Whether or not perceived risks truly correspond to facts, it is clear that coastal Chinese residents identify offshore oil and gas drilling as very risky. This high-risk perception is an outcome of various factors, to which coastal environmental attitudes and the mass media contribute the most. Previous research has shown that coastal and urban citizens in China tend to hold an environmentally-friendly worldview (Liu & Mu, 2016; Xiao et al., 2013). They feel concerned not only about general environmental problems such as air and water pollution (Shen & Saijo, 2008) but also about the construction of large-scale chemical projects, such as para-xylene and nuclear power plants (Huang et al., 2013; Steinhardt & Wu, 2016). Compared

to citizens in other regions, coastal residents possess a more thoroughly developed sense of environmental awareness. Thus, concerns about environmental quality seem to influence their risk perception of offshore drilling. Another reason for such high-risk perception may derive from the mass media's coverage of environmental disasters. For many people, media reports serve as the primary method of gaining disaster information, thereby shaping personal perception (Quarantelli, 1991; Yan & Bissell, 2018). Previous studies from western countries found that media narratives largely centered on the ongoing situations of disasters and their impacts upon physical health and economic growth while contributing poorly to the promotion of public understanding and the preparedness of environmental crises (Houston et al., 2012; Quarantelli, 1991). That is to say, mass media had the potential to properly reinforce public awareness of severe risks but insufficiently provided individuals with the whole image of an environmental disaster. Although it remains unclear whether this remains true for mass media in China, the pursuit of news values, by the journalism industry, particularly with eye-catching severe-risk stories, is consistent worldwide.

Although public support and risk perception of offshore drilling are both negative, this study's statistical analysis reveals a moderate amount of trust in offshore drilling statements. Overall, coastal Chinese citizens have moderate confidence in offshore drilling claims made by scientists regardless of their affiliations. It seems paradoxical that citizens lack support and sense the high risk associated with offshore drilling but have faith in statements about offshore drilling. However, citizens have confidence in the identity of scientists rather than in the sources of their claims. In this study's questionnaire, these statements are specified as coming from scientists, which are highly trusted and esteemed in Chinese society because they represent troubleshooting, prestige, and professionalism (CRISP, 2010; Hongbin et al., 2008; Zhongliang, 1991). Such respect for scientists is irrespective of whom they are working for, as their judgments are deemed trustworthy. A second possible explanation is the lack of information about offshore drilling. Historically, coal, rather than oil and gas, has dominated the Chinese energy consumption market (BP, 2019; NBS, 2019). Therefore, public interest in offshore oil drilling has hardly developed. Finally, as mentioned earlier, the media are inclined to report accidents instead of scientific knowledge because accidents are considered more newsworthy (Harcup & O'neill, 2017). Consequently, coastal citizens do not have many other options besides trusting claims from their only sources, i.e., the oil industry and environmental groups.

4.4.2 NIMBY Mentality and Trust Differences in Offshore Drilling Attitude

The present study discovered that coastal residents' opposition varies upon different drilling places in China. Coastal citizens object to offshore drilling in their current residential city notably more than drilling in remote areas. This opposition difference turns out to be statistically significant. It is safe to say NIMBY mentality emerges in coastal residents' attitudes toward offshore oil and gas drilling in China. A series of previous studies captured NIMBY mentality in public attitudes toward different kinds of energy projects in China (Gu, 2016; Huang & Yang, 2020). The present study confirms that NIMBY mentality also applies to offshore oil and gas drilling in coastal China. Although research about Americans' attitudes toward

energy demonstrated that NIMBY mentality does not usually influence citizens' opposition to oil projects, researchers also discovered that public support decreases when oil projects are nearby (Konisky et al., 2020; Michaud et al., 2008). This mentality has been explained from various perspectives, ranging from the unbalanced distribution of costs and benefits, to the awareness of residential rights and identity, to the demand for more public participation (Johnson, 2010; Sun, 2015; Wu & Dai, 2014). In the context of offshore drilling, NIMBYism signifies a disconnect between coastal energy development and ocean conservation. For coastal residents, the emergence of NIMBY mentality proves their rejection of potentially-contaminating drilling projects but does not necessarily imply their concern for environmental quality. In many cases, environmental protection is used as an occasional argument to cover NIMBY considerations (Johnson, 2010; Michaud et al., 2008). In other words, ocean conservation is not the end but the means for resisting offshore drilling, as ocean conservation is deemed secondary to residential needs. NIMBY mentality may simply be the result of a collective need for better living conditions, whereas ocean conservation serves as an argument to justify residential rejection. Such a situation brings about challenges to the sustainable integration of coastal energy development and ocean conservation.

Aside from NIMBY mentality, coastal Chinese residents also cast different levels of doubt on scientific claims regarding offshore drilling. Compared with the oil industry, coastal citizens have more confidence in scientific messages from environmental groups, whether the message emphasizes safety or risk. This finding differs from Carlisle et al. (2010), who found that, in the American context, the source alone made no difference in public trust, but the interaction between source and content could. When it comes to content, coastal citizens are more likely to believe negative news rather than positive news about the safety of drilling, irrespective of the source of the message. This is consistent with results from earlier studies that determined negative news about potential risks is more accepted by the public than positive news (Carlisle et al., 2010; Kraus et al., 1992). Both coastal Chinese and coastal Californians have more confidence in messages that indicate risks than safety, while the source of those messages only matters to coastal Chinese residents. This may be related to the different priorities that coastal Chinese and coastal Californians assign to the credibility of their sources. For coastal Chinese residents, the direct interests of oil companies in offshore drilling unavoidably impair the credibility of their messages, thereby causing individuals to find environmental groups more trustworthy. Moreover, the disappointing responses from ConocoPhillips to the Penglai 19-3 Oil Spill (Yin et al., 2015) could have also eroded public trust in statements from the oil industry. In contrast, Californians may consider that a source's credibility is secondary to one's core values or existing beliefs (Carlisle et al., 2010).

4.4.3 Demographics and Offshore Drilling Attitude

This study also yields several findings regarding demographic differences in offshore drilling attitudes. Men and individuals who think religious beliefs are important tend to be more pro-offshore oil and gas drilling than women and those who think religious beliefs are less important in life. Trust difference in scientific claims relates to different dietary habits.

Vegetarians/vegans have significantly less confidence in scientific statements than those who consume meat daily. In terms of predictors of offshore drilling attitude, this study determined that gender (female), occupation (self-employed), religious attitude (important in life), and dietary habits (vegetarian/vegan) are influential to citizens' support of offshore oil and gas drilling. Some of our predictors are consistent with findings from American cases, i.e., women in the United States are also found to be less supportive of offshore drilling than men (Michaud et al., 2008; Mukherjee & Rahman, 2016). Notably, two demographic factors that were uncovered to be predictors in the Californian study (Michaud et al., 2008), namely education and age, turn out not to be influential in this study. In fact, the connections between offshore drilling support and education or age are still far from clear. Despite some literature that discovered education and age to be influential in offshore drilling support, Ceccoli (2018) presented different results about education as a predictor. In the California study from Michaud et al. (2008), although education and gender were predictors of Californians' offshore drilling support, they were each only influential to one of the drilling locations, rather than all of them. Further research is still needed to better understand the correlation between offshore drilling support and education or age.

To some extent, the outcomes of this study were relatively expected. A robust body of literature has revealed that females are generally more aware of environmental protection than males (Domingues & Gonçalves, 2020; Mohai, 1992; Zelezny et al., 2000). Compare to men, women are more likely to view the world as a whole and to be aware of the harmful consequences of environmental degradation (Stern et al., 1993). As for the role of religion in offshore drilling attitude, existing literature suggests that religiosity is usually negatively correlated with concerns about the environment (Arbuckle & Konisky, 2015). In nearly all monotheistic religions, humans have the role of environmental stewardship and priority over nature (Wardekker et al., 2008). For people who deem religious beliefs to be important in life, it is necessary to take initiatives (human activities) to fulfill their sacred stewardship. Vegetarianism is connected to an environmentally-friendly outlook (Fox & Ward, 2008; Ruby, 2012) which conflicts with the practice of offshore oil and gas drilling. The low support of offshore drilling and low confidence in scientific statements from vegetarians/vegans may stem from this positive environmental link. Interestingly, this study's data analysis revealed the self-employed occupation to be a predictor of support for offshore drilling. The decision to enter into self-employment usually signifies better tolerance of uncertainties in life and the preference for independency (Ahn, 2010; Douglas & Shepherd, 2002). It is plausible that these qualities of self-employed individuals facilitate a pro-offshore oil and gas drilling attitude.

4.5 Conclusion

This research investigated coastal residents' attitudes toward offshore oil and gas drilling in China. The data have revealed that coastal residents maintain low levels of support, high risk-

perception, and moderate trust in offshore oil and gas drilling. NIMBY mentality is apparent in coastal residents' support toward offshore drilling because residents object less to the drilling in remote areas than in their respective cities. Coastal residents tend to trust scientific statements from environmental groups more than from the oil industry and have more trust in information according to which offshore drilling is riskier instead of safer than previously anticipated. Gender, occupation, religious attitude, and dietary habit are predictors of support for offshore oil and gas drilling.

This research may help to promote a better understanding of a sustainable human-ocean relationship. Given the competing interests in offshore drilling, knowledge of citizens' attitudes is of vital importance to make considered judgments and to formulate long-term energy development strategies, both by governments and the energy industry. The findings of this study are beneficial to various stakeholders in China's coastal zone governance sector. Policy-makers can anticipate NIMBY mentality or even protests when planning future offshore drilling projects.

Finally, some limitations of this study must be mentioned. The online survey included few replies from rural areas and the elderly. This may explain why the data analysis section of this study showed no differences in results for the differentiation in age or for living in urban or rural areas. Furthermore, this research did not further investigate the reasons behind some demographic differences in coastal citizens' attitudes toward offshore drilling. Although this study discovered that religious attitude and occupation are predictors of offshore drilling support, it is inconclusive what religion or religious beliefs are influential and how exactly self-employment contributes to a pro-offshore drilling attitude. These outstanding issues remain to be investigated in more detail.

Endnotes

[1] The 22 coastal cities included in this study are: Dalian, Yingkou, Qinhuangdao, Tianjin, Yantai, Weihai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Xiamen, Shantou, Guangzhou, Shenzhen, Zhuhai, Zhanjiang, Beihai, Haikou, and Sanya.

[2] See different State Council documents in 1979, 1980, 1981, 1984, 1985, and 1988.

5

Chapter 5

Cultural conditions behind public attitudes towards marine life in China

Abstract
Previous studies have shown that Chinese society views marine life secondary to certain human needs and that moral concern for consuming and scientific using of marine life seems weaker than in other countries or regions. These studies have paid little attention to explain this difference, however. The present chapter aims to fill this knowledge gap by investigating traditional Chinese culture and society. The lower importance of marine life and weaker moral concern for certain usages can be explained by three higher-level attitudes in particular: anthropocentrism, collectivism and pragmatism. Anthropocentrism, collectivism and pragmatism find their origin on the one hand in the millennia old Chinese history and agrarian society in which agriculture production has dominated every aspect of social life. On the other hand, anthropocentrism, collectivism and pragmatism is reflected in and further amplified by traditional Chinese culture based on Confucianism.

Keywords
Marine life; Public attitudes; Chinese Culture; Agrarian Society; Confucianism

This chapter is based on:
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5.1 Introduction

Successful preservation of marine biodiversity and coastal system require deep understanding of public awareness of marine life (Luksenburg & Parsons, 2014; Tonin & Lucaroni, 2017). Since the end of the last century, social scientists have therefore begun to investigate how citizens perceive marine life and marine life related issues. Some of these scientific efforts devoted to explore Chinese attitudes towards marine life and marine life using and obtained interesting findings. The Chinese, in general, admit the values of marine life while tend to view marine life as secondary to certain human needs. For instance, although 85% of the respondents in a survey believe “plants and animals have as much right as humans to exist”, only 36.6% clearly oppose to the idea that “human economic gain is more important than setting aside more water areas for marine life” (Chen & Martens, 2022a). One thought-provoking finding lies in the different attitudes towards some marine life usages between the Chinese and people in Western countries like the United States. In comparison to Western countries, for example, the Chinese appear less troubled to use marine life and other animals for food and scientific research (Chen & Martens, 2022b; Su & Martens, 2017; Su et al., 2022). In other words, moral concern for consuming and scientific using of marine life seems weaker in China.

Existing literature portrayed a general image of public attitudes towards marine life in China. To the Chinese, public perception of marine life are particularly shaped by moral and environmental orientations. (Chen & Martens, 2022a, 2022b). Moral orientation can be described in two dimensions (Forsyth, 1980): the first dimension is idealism, i.e., to what degree people believe desirable consequences can always be obtained by right behavior; the second dimension is relativism, i.e., to what extent people question the existence of universal moral rules when making decisions. In modern Chinese society, the more individuals believe good actions will lead to good results, the more favorable attitudes they hold towards marine life (Chen & Martens, 2022b). The more individuals question the existence of universal moral codes, the less concerned they are towards marine life protection (Chen & Martens, 2022b). Chinese attitudes towards marine life are also related to environmental orientation (Chen & Martens, 2022a).The more individuals endorse an eco-centric view, the more positive attitudes towards marine life they are. The more individuals support an anthropocentric view, the less friendly they are towards marine life protection. It can be concluded that a low idealistic morality, high relativistic morality, and high anthropocentric orientation dominate the public attitudes towards marine life in contemporary Chinese society, resulting in the perception of marine life as of secondary importance and a weaker moral concern for consuming and scientific using marine life.

On the one hand, such differences in moral concern for certain usages between China and other countries may simply result from differences in economic development (Frank, 2008). Educational or scientific using of animals were also once acceptable in Western societies some decades ago (Driscoll, 1992). On the other hand, however, differences in attitudes towards marine life and animals may truly reflect different worldviews that shaped by the unique

cultural and historical contexts. Understanding this weaker moral concern requires further examination into the social and historical contexts that influenced public attitudes towards marine life in China. The purpose of this chapter is therefore to investigate the cultural and historical origins of Chinese attitudes towards marine life as well as the lower moral concern of consuming and scientific using of marine life.

5.2 World views underlying Chinese Attitudes towards Marine Life and Animals

Low idealistic morality, high relativistic morality, and high anthropocentric orientation can be related to three worldviews prevailing in Chinese society through Chinese history: anthropocentrism, collectivism, and pragmatism.

Anthropocentrism is the view that non-human live has no intrinsic value of its own, but is only of instrumental value for human wellbeing. Individuals who hold an anthropocentric worldview tend to assess the values of everything upon human needs and place the satisfaction of human needs above other living creatures. It implies a philosophy that human life and society should be given top priority (Murdy, 1975). Non-anthropocentric views include for example sentientism, the view that all sentient beings have moral standing (see e.g. Singer, 1974) and biocentrism, the view that *all* living beings have moral standing (Taylor, 1981). The anthropocentric inclination is a dimension of the environmental orientation, which has been uncovered to be an influential predictor of Chinese attitudes towards marine life as well as certain marine life usages, including food, medical researching, hunting/fishing (Chen & Martens, 2022a). Self-evidently, people with a more anthropocentric outlook will consider it less problematic to use marine life and other animals for food and medical research than people who are more susceptible for the idea that other lifeforms deserve moral consideration for their own sake as well.

Collectivism is the view of being part of a collective and being primarily motivated by duties to that collective (Leung, 1996). The collective is therefore more important than the individual. Collectivism is contrasted by individualism, in which individuals see themselves as independent of collectives and are primarily motivated by their own preferences and needs. In a collectivist society, individuals are closely linked together and sharing universally-acknowledged social norms, beliefs, and goals (Triandis, 1995). Eastern Asians are generally found to be more collectivistic than Western people, such as Americans (Norenzayan & Nisbett, 2000) and China is no exception (Yang, 1995). According to Leung (1996), Chinese collectivism is based on the underlying belief that if each person follows group norms and acts in its interests, the group will be harmonious and prosperous. Idealistic morality incorporates a fundamental concern of the welfare of others and if harming is avoidable to produce good (Forsyth, 1992). Such pursuit for greater good and respect of others correspond to the emphases of group harmony and collectivistic interests in Chinese collectivism. Undoubtedly, sometimes group harmony/interest

requires the sacrifice or infringement of individual human as well as marine life/animal rights. As long as the use of animals or marine life serves the greater good of the collective and ecosystem functioning does not deteriorate, such use is justifiable.

Pragmatism is the view that theories or beliefs should be evaluated in terms of the success of their practical application and their consequences in real-world (James et al., 1975; Suter & Cormier, 2013). From a pragmatist's view, the ultimate goal of thinking is to act in life and to find out what actually works to solve the real situation. Pragmatism, contrasted by dogmatism and idealism, has long been characteristic of Chinese thinking and culture (Nisbett, 2004; Ping, 2002). The textbook example of Chinese pragmatism has been the statement by Deng Xiaoping who did not care about the "colour of the cat" so long as it catches "the mice" (Pye, 1986). The idea that what matters is what works of course raises the question 'works for whom?' If the answer to this question refers to oneself or the collective of which one is part, then such pragmatism automatically has anthropocentric tendencies (Minteer, 2008). Pragmatism is also related to the idea of moral relativism, the rejection of absolute moral truths. However, if norms become the outcome of what works and what can represent itself in decision making, then once again it is understandable that non-human nature will pull the shortest straw.

5.3 Historical origins of anthropocentrism, collectivism and pragmatism in China

In fact, the anthropocentrism, collectivism, and pragmatism are deeply rooted in the thousands years of agrarian society. Ancient Chinese people were among the earliest groups who were able to recognize and began to use marine life in human history. For a long time in Chinese history, marine life largely served as three usages. The first one is food. In prehistory China, coastal inhabitants started to fish marine life during the Neolithic age. Archaeologists uncovered some relics of marine fishing that could data back to Dawenkou culture (BC 4100 – BC 2600) when excavating the Beiqian site, a coastal site located at Jiaodong peninsular (Wang et al., 2012). The second usage is sacrifice or worship. According to Rites of Zhou, a classic Confucianism work, shellfish like clams and conches were used in the sacrifices of royal family (Zheng, 2010). The third usage is medical using. The Inner Canon of the Yellow Emperor, the existing earliest Chinese medical work, has recorded the medical effects of some marine mollusks such as inkfish and abalone (Ni, 1995). Besides, early in Shang dynast (BC 1600), seashells was already used as currency in commodity exchange (Yang & Chen, 2000). It goes without saying that ancient Chinese had not only understood the living habits of certain marine life, but also mastered and incorporated the knowledge of marine life into their daily life. Both consuming and scientific (medical) use of marine life have their historical roots in Chinese society.

Nevertheless, that does not mean marine life had exerted huge impact on ancient Chinese society or draw much attention from ancient Chinese people. To the average citizens, especially

inland inhabitants, ocean or marine life was still something remote and exotic. For example, the descriptions of large marine mammals in traditional Chinese literature were usually mixed with strong mythological and legendary elements and combined with astrology claims (Zou, 2014). There was still a long distance between large marine mammals and daily routines of ordinary people. A small part of the reason was the limitations in acquiring the knowledge and access to the marine life by then. While more significantly, it was because the ancient Chinese society was an agrarian society (Huang, 2018; Wittfogel, 1957). The frame ancient Chinese applied to recognize marine life, built by anthropocentrism, collectivism, and pragmatism, were entrenched in the agriculture production and agrarian society.

5.3.1 Agrarian Society

For thousands of years, agriculture development predominates all aspects of the society in ancient China (Lee, 1921) in which the self-sufficient small peasant economy constituted the majority forms of the ancient Chinese economy. This small-scale peasant economy is simple in the division of labor and efficient in family supporting. Usually, men are responsible for tilling the land and women engage themselves in spinning and weaving. Meeting family's needs is the main goal of both their work (Huang, 2018). The rest food or fabrics, if there lefts any, would be used for commodity exchange. Such a small-scale peasant economy is also quite physically demanding as well as internally vulnerable to outside changes. Cultivation production, in an age of low productivity, is heavily relied on human labor. The primitive tools and animals' forces are helpful but rather limited in converting to the output. Intensive farming and meticulous working from human beings are imperative for the peasant economy. Similarly, in an age of low productivity, the external environment can easily influence the development of agriculture. Different physiographic conditions determine that certain land will only suit certain crops. In order to maintain soil fertility, ancient Chinese gradually learned to choose the right crop for the right land. Moreover, any variation in natural conditions, such as rainfall, sunlight, and temperature would result in different agriculture yields each year. Not to mention the huge impacts on the peasant economy once a natural disaster occurs. Under such circumstances, good weather and good harvest become the ultimate wish for every ancient Chinese.

In addition to economic forms, the significance of agriculture production is also displayed in the political agenda. On the one hand, almost all past Chinese dynasties gave agriculture production priority among priorities. Without other industry, agriculture production is almost the only resource of financial revenue (Lee, 1921). Emphasizing physiocracy and restraining commerce were established as a fundamental state policy for thousands of years (Huang, 2018; Zhang, 2015). Building water-engineering projects and preventing potential natural disasters from happening are two major concerns of the ruling circles in each dynasty. As long as every tiller gets land to cultivate, a stable regime is properly guaranteed. On the other hand, the emperor, ever since the Qin Dynasty (221 BC), served as the spokesman for the interests of the landowner class essentially. During the long history, the landowner class supports the economy system in imperial China (Chen, 1984). The landowners help sustain the stability of autocratic monarchy and in return the emperor protects the landowner group's benefits. For the public,

once they are able to involve themselves in the man-ploughing and women-weaving business, certain life quality could be properly obtained. It is unlikely for them to question the legitimacy of current political settings. Eventually, promoting agriculture development is employed by the emperor as means not only to increase profits and enrich the Treasury, but also to maintain social stability and secure the political hierarchy.

As to social life, agriculture production also contributes to the formulation of social orders and values. First and foremost, the small-scale peasant economy construes the basic social order in ancient China. The man-ploughing and women-weaving peasant economy makes family the basic unit of society (Huang, 2018). Since a single family can hardly withstand risks from the outside environment, people usually gather up to jointly deal with the external difficulties and threats. As a result, plenty of families live together and form the farming community. The farming community serves as a grass-root organization which both directs collective affairs and binds individuals together. More importantly, decisions from the farming community usually represent collective wills. Following that, the small-scale peasant economy builds up social norms that corresponding to an agrarian society. The heavy farm works train people to bear hardships and keep hardworking. The deprivation surrounding forces individuals to live in thrift. The close connection with the farming community encourages members to work in unity and help each other. The deep binding with land also developed a provincialism mentality among the Chinese, making them too rooted down to consider moving. Inevitably, these norms also incorporate some unequal distribution of power. Within the family, the men obtain higher status than the women due to their advantages in handling the physical cultivation work. Outside the family, the farming community weighs more than families, as this authority organization undoubtedly owns more power and resources. Lastly, the small-scale peasant economy shaped ancient Chinese' beliefs to a large extent. For the individuals, agriculture production associates them with nature closely. This facilitates the establishment of a simple environmental view, namely revering while utilizing nature. The ancient Chinese revere the nature in that human abilities are so limited in front of nature. Any changes in the nature would bring enormous impacts to agriculture production and human life. The ancient Chinese are also enthusiastic about transforming nature because nature provides them with all the necessities for living. Since good weather and good harvest become the ultimate wish of the public, a complete set of ritual activities is created and established as social principles. The ritual activities soon become an indispensable part of community life. By carrying out different ritual activities, the average people show their worship to nature and pin their hopes for a good harvest

5.3.2 Anthropocentrism

The agrarian society fostered anthropocentrism inclinations among Chinese in which the hardships in agriculture production and farming-based norms and beliefs play a substantial role. Since agriculture production, in the time of pre-industrial era, is both physically demanding and internally vulnerable, it is not even optional for ancient Chinese considering the limited human abilities in front of the mighty nature. Without reaching self-sufficiency, such as food, water,

clothes, etc., humans are not able to engage themselves in other tasks. Likewise, the low productivity of the small-scale peasant economy also drives individuals to center production growth. During the years of natural disasters, the surviving problem can be doubling amplified. Consequently, people have to take advantage of animals to improve productivity. This includes but not limited to using animal force as substitute for human labor; making tools or clothes upon animal fur and bones; taming and consuming animals to support human life. In terms of marine life, it displays as consuming marine life for food; utilizing certain marine life in medicine; employing seashells in sacrifice and commodity exchange. What's more, the farming based norms and beliefs added to the anthropocentric mindset of the Chinese. For the ancient Chinese, living in thrift and bearing hardships were taken for granted as much as utilizing animals or marine life for cultivation or food. Being subject to the knowledge level by then, the values of human beings are regarded as superior to the environment and other living creatures. These ideas benefit ancient Chinese to work hard and act vigorously while constantly reinforce the anthropocentric inclination in Chinese society. Sometimes, major social events and background can greatly boost up the anthropocentrism in society. In the period of the *Great Leap Forward* (1958-1962), chairman Mao's statement that "Man must conquer nature" pushed the anthropocentric inclination to an extreme level, causing huge impacts on the environment in China (Shapiro, 2001). Anthropocentrism is strongly anchored in Western society as well (see e.g., White, 1967), but over the last decades concern for animal wellbeing has gained ground which may have resulted from economic development (Frank, 2008).

5.3.3 Collectivism

Parallel with anthropocentrism, collectivism also grows out of the hardships in an agrarian society, next to the needs for cultivation production and grassroots governance. According to Hofstede (1980), economic development encourages individualism, while subsistence farming fosters collectivism (see also Buggle, 2020). Since a single family can hardly withstand risks from the outside environment, people usually gather up and form the farming community. The farming community serves as a grass-root organization which both directs collective affairs and binds individuals together. Following that, the small-scale peasant economy builds up social norms and beliefs that corresponding to an agrarian society. The heavy farm working, the deprivation surroundings, and the close connection with the farming community push people to be hardworking, tough, and collective (Zha et al., 2006). On the one hand, individuals heavily count on the various resources granted by the farming community as one is powerless in defending against harsh climates (Van de Vliert et al., 2013) and undertaking large agricultural projects. The community, regardless of getting unified through blood or geographic locations, offer necessary helps in both daily cultivation and defending risks. On the other hand, the community is the grass-root authority in ancient China (Huang, 2018). Actively promoting collectivism serves as an effective way to enhance group cohesion and manage collective affairs. Collectivistic thoughts drive community members to stick together and strive for mutual interests. Besides, ancient Chinese are severely attached to their land (Huang, 2018). The deep binding with land and the provincialism mentality give rise to a strong attachment to the people

and surroundings grounded on that land, namely the clan, the ancestors, the family name, etc. Often, a person is rather the representation of his or her family, clan, and community than an individual. Collective honors and interests always weigh more than individuals' do. For example, ancient Chinese take the ancestor worship rituals seriously as ritual observance reveals their self-identities and expresses their reverence to the forebears as well as the social hierarchies (Seiwert, 2016).

5.3.4 Pragmatism

Many social scientists noticed that pragmatism in the Chinese context does not exactly parallel its meaning in western discourse (Pye, 1986). Chinese pragmatism is unique in that: 1. Seeking truth from facts does not center Chinese pragmatism but meeting practical needs does (Li & Wu, 2016). Without the possibility of practical application, truth can also become "doctrines" to some extent. 2. Chinese pragmatism gives enormous flexibility in dealing with difficulties at hand, even though such flexibility may contradict with targets in the long run (Li & Wu, 2016; Pye, 1986). New conditions always ask for new measurements and any change in time or location would result in changes in beliefs and methods as well (Pye, 1986).

Actually, the uniqueness in Chinese pragmatism also takes root in the long history of agrarian society. Making full use of the environment to develop agriculture is a token of Chinese pragmatism. Seeking practical application and flexibility are essentially entailed by the cultivation production. The highly demanding physical work and innate vulnerability of small-scale peasant economy force people to be practical in weighing situations and flexible in making decisions. For instance, adjusting measures to local conditions is taken as truth in farming all the time. Considering the huge geophysical differences exist between south and north China, crop cultivation in south China is mainly rice but mostly wheat in north China. The self-sufficient target of the natural economy, on the one hand, determines the cultivation production stay small-scale. As long as family needs are adequately satisfied, farmers usually have scarce interest in producing more for trading. Instead, diversifying their agriculture forms based on the geophysical environment, including fishing, sericulture, citrus, and tea planting, usually attracts more attention for farmers. On the other hand, the self-sufficient goal shapes the recognition of moderation in Chinese society. Given that the amount of life essentials to fulfill family needs is by no means huge, individuals formulate rational recognition regarding what is necessary. Such a rational mentality soon becomes prevailing and is perceived as a virtue in Chinese society. Combined with the deep binding with land, the rational mentality facilitates agriculture development in return. For example, in order to maintain soil fertility, crop rotation and the fallow system become necessary in ancient Chinese farming. The self-sufficient goal of cultivation production is therefore well-guaranteed.

5.4 Confucianism-centered traditional Chinese culture and anthropocentrism, collectivism, pragmatism

The long agrarian society in Chinese history provided with natural soil breeding anthropocentrism, collectivism, and pragmatism. However, it does not ensure these values will be universally-acknowledged by the public. The traditional Chinese culture, especially the philosophy of Confucianism, reflects and further amplifies anthropocentrism, collectivism and pragmatism in Chinese society. Immersed themselves in the Confucianism-based traditional Chinese culture, Chinese people also tend to be more anthropocentric, collectivistic, and pragmatic in life.

5.4.1 Confucianism

Confucianism philosophy is the cornerstone of traditional Chinese culture and represents the essence of Chinese traditions to a large extent (Guang, 2013). Confucianism theories incorporate ideas and thoughts from its founder Confucius and his followers such as Mencius, Dong Zhongsu, etc. Confucianism is a humanistic philosophy (Chang, 2013; Havens, 2013) that focuses on human values, establishes a set of ethical virtues and stresses human contributions to society. Confucianism is also a mundane philosophy that urges individuals to fulfill their duties and pay attention to their life in the secular world (Yao, 2000). The ultimate pursuit of Confucianism is to be a *junzi* ('superior person'), which stands for an attainable model of a cultivated, virtuous character (Yao, 2000). For Confucius (541-479 BC), a philosopher and politician living during the Zhou dynasty, *ren* (benevolence) and *li* (ritual) were the two most important virtues (Chang, 2013; Rainey, 2010). Confucianism also introduced the concept of *tao* which refers to the ethical, fundamental, and sophisticated order that governs the relationship between humanity and the world as well as interpersonal relationships (Rainey, 2010; Yao, 2000). Regarding the relationship between humans and the world, Confucianism proposes a *tianrenheyi* (the oneness of humanity and heaven) concept, which means human beings coexist and form one unity with nature, heaven, a myriad of things in this world (Weber, 2005). In addition, *zhongyong* (doctrine of the mean) recognizes moderation as the most ideal state and is highly valued in Confucianism (Ni, 2017).

5.4.2 Anthropocentrism

Just as Western humanism (Ehrenfeld, 1981), Confucianism has strong anthropocentric tendencies as it is particularly focused on the human perspective and human needs. By and large, the anthropocentric inclination of Confucianism is written in its genes, the Confucius. As a great philosopher and educator who lived in a time of turbulence, his lifelong pursuit was to cultivate individuals to change the troubled society and build a harmonious world (Rainey, 2010). That pursuit drives Confucius to build the *junzi* role model and set *ren* (benevolence) and *li* (ritual) as the two fundamental virtues. Benevolence (ren), considered as the highest virtue by Confucius, is the collective term for love, empathy, honesty, sincerity, sympathy, and so forth (Chang, 2013; Rainey, 2010). The object can be other people, animals, marine life, nature, etc. Ritual (li), serving as an external expression of internal virtue and art, denotes not only the

religious rituals of the time but also decent behavior and honorable etiquette (Rainey, 2010). Although the object of *ren* (benevolence) can be other people, animals, marine life or nature in general, the primary objective is that common people turn into *junzi* and subsequently construct an ideal society. Consequently, both the role model and basic virtues have strong anthropocentric inclinations. Some of Confucius' followers go even further. According to the influential Neo-Confucian thinker Wang Yangming (1472-1529), human needs supervene the needs of other living beings (Blakeley, 2003). Confucianism is certainly not purely anthropocentric, however. The *tianrenheyi* concept represents and requests a holistic perspective to identify their relationship with the world. The essence of Confucianism theories lies in its pursuit for meanings and values in the dynamic interaction between humanity and nature rather than simply understanding it with a dichotomous frame (Havens, 2013; Weiming, 2017; Xinzhong, 2014).

5.4.3 Collectivism

Confucianism prizes collectivism through emphasizing the values of families and communities as well as the central virtues it structured. In Confucianism, the family is the place where individuals do not only receive moral cultivation and shape their personality but also where they practice basic virtues and ethical principles (Rainey, 2010; Yao, 2000). In this image, communities and the state are larger versions of a family. Individuals gradually learn to perform their roles inside a family and position themselves in the social hierarchy. To Confucius, harmonious family relations would thus pave the way for a harmonious society. Confucianism views personal aims as secondary, and one sometimes must sacrifice to collective objectives as achieving aggregate goals brings more benefits to society (Lin & Huang, 2014). Highlighting family and community values facilitate people to bind together and appreciate the collective they belong to. In addition, some of the basic virtues in Confucianism are strengthening this binding and appreciation. The aforementioned *ren* (benevolence) and *li* (ritual) require love and etiquette to other family or community members, improving interpersonal communication and relationships. Loyalty (*zhong*) and filial piety (*xiao*), two other important virtues in Confucianism, request devotion and respect to one's ancestors as well as rulers. These virtues entail unconditionally prioritizing collective interests or other member's interests to one's own interests.

5.4.4 Pragmatism

Following *tao* ('the way') and *zhongyong* (doctrine of the mean) to understand ones surroundings and discover truth constitute the chief part of pragmatism in Confucianism. Instead of other (religious) philosophies that reflect on the spiritual world and the afterlife, Confucianism motivates people to integrate into society and achieve worldly success. Confucianism's *tao* concept, everything follows its own *tao*, directs people to understand the world pragmatically. Since outside surroundings are guided through the *tao* of heaven, people ought to keep a respectful distance and perceive them as in constant change (Yao, 2000). According to Confucianism, one should therefore have a pragmatic attitude and 'go with the changes' (Kolstad & Gjesvik, 2014). The *zhongyong* concept introduces a peaceful mind to

recognize the world and highlights the significance of moderation. On the one hand, this doctrine excludes the possibility of simple dichotomy and absolute attitude dominate public awareness. On the other hand, it guides individuals to be flexible to the so-called "truth" and "knowledge". Indisputably, it does not mean Confucianism is not interested in discussions regarding truth or knowledge, as the basic virtues could prove, Confucianism philosophy just emphasizes more the practical sides associated with abstract notions. This is consistent with Confucianism's attitudes towards heaven and ghosts. Confucius does not deny the existence of natural power or ghosts, instead, he suggests people focus on this life and keep a respectful distance from ghosts and spirits (Yao, 2000). Xunzi, a well-known follower of Confucius, goes one step further and argues that people ought to grasp the natural laws and make use of them (Rogacz, 2017).

5.4.5 Taoism and Buddhism

Besides Confucianism, Taoism and Buddhism are other two important philosophies which exert great influences on traditional Chinese culture (Guang, 2013). Contrary to Confucianism, both Taoism and Buddhism are transcendental philosophies that pursue the wealth of the spiritual world and the liberation of individual thinking. *Tao* ('the way'), the essence and source of the universe, and *wuwei* (inaction), doing nothing and everything will be done, serving as the core concepts in Taoism and both standing for complying with the natures of a myriad of things (Creel, 1956; Goodrich & Creel, 1973). More significantly, Taoism philosophy incorporates the ideas of naive dialecticism. Lao tzu's discussion about two poles (yin & yang) represents this naive dialecticism, in which two opposite sides are not only in the tension contrary to each other but also in active harmony mutually depended on each other (Peng et al., 2006). Buddhism philosophy is centered by the ideas of *anicca* (impermanence) and *anata* (no-self), the former one refers to the world is in a constant state of flux and nothing is stable or permanent and the later one means humans are also permanently changing and there is no such thing called "I" (Deegalle, 2017). Buddhism cosmology proposes a theory of dependent arising, which represents all phenomenon arise in dependence upon other causes and conditions (Gethin, 1998).

Since Buddhism rejects the "self" notion and Taoism calls attention to our spiritual world, it is obvious they have nothing to do with, or even contrary to, anthropocentrism. Likewise, valuing spiritual liberation and human existence in the next life signify collectivism is in the interest of neither Taoism nor Buddhism. Nevertheless, these two thoughts contribute to the prevailing pragmatism in Chinese society. The philosophies of *wuwei* (inaction) in Taoism and *anicca* (impermanence) in Buddhism both highlight the perspective that changing is eternal and no need to force things into given outcomes. Since no truth or knowledge is perpetually correct, absolutizing acquired knowledge or information is inadvisable. As a result, individuals ought to hold a flexible attitude and follow "new conditions always ask for new measurements". Moreover, naive dialecticism exists in both *yin & yang* theory and dependent rising doctrine, stressing all phenomenon arise in dependence upon other causes and conditions. Taoism and Buddhism make it clear that a dichotomous way of thinking in life is inadequate. These

thoughts provoke a holistic worldview and prevents individuals from understanding situations in a single dimension.

5.5 Discussion and conclusion

Previous studies have shown that the Chinese view marine life secondary to certain human needs and moral concern about consumption and scientific use of marine life seems weaker in Chinese society than in other countries or regions, but have paid little attention to explain this difference. The present chapter has investigated traditional Chinese culture and society and found that the lower importance of marine life and weaker moral concern for certain usages can be explained by three higher-level attitudes in particular: anthropocentrism, collectivism and pragmatism. Anthropocentrism is the view that non-human live has no intrinsic value of its own, but is only of instrumental value for human wellbeing. Collectivism is the view that the collective is more important than the individual, implying that marine life can be sacrificed for the greater good of society as long as human influence on ecosystem functioning remains within limits. Pragmatism implies a rejection of strict moral rules and a focus on what works for society, once again at the expense of moral concern for marine life. Anthropocentrism, collectivism and pragmatism find their origin on the one hand in the millennia old Chinese history and agrarian society in which agriculture production has dominated every aspect of social life. On the other hand, anthropocentrism, collectivism and pragmatism is reflected in and further amplified by Confucianism on which traditional Chinese culture is based.

As a matter of fact, the continuity of Chinese culture and history facilitates understanding of the use of marine life in Chinese society. The main usages marine life served for ancient Chinese, except for sacrificing is no longer a major issue in life, have mostly passed down to modern Chinese society (consuming and medical/scientific using). Likewise, traditional Chinese culture still exerts big influence on the decision making of Chinese government. Over the last years, the Chinese government has increased its efforts to preserve maritime life, such as a yearly moratorium on fishing along the Chinese coasts during summer, the establishment of marine nature reservation areas and the introduction of marine farming to replace coastal fishing. Given the strong influence of Confucianism in Chinese society, the Chinese government could enhance its policy by communicating it along points of grip in Confucianism, such as “zhongyong” and “dao”.

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Chapter 6

Conclusion

6.1 Introduction

As an old Chinese saying goes: *"不忘初心，方得始终"* ("*Never forget why you started, and your mission can be accomplished*"). Our research project started against the background of globally degrading marine ecosystem resulting from unsustainable human use of the oceans. This dissertation investigated how to achieve sustainable human use of the oceans by examining public attitudes towards marine life and offshore oil and gas drilling in contemporary Chinese society. In this project, we have not only explored how coastal Chinese perceive their utilization of maritime resources but also obtained insights in coastal residents' moral orientation, core environmental values, and the unseen nimbyism mentality in offshore energy development. The research was performed by an integrated assessment method, including an online survey and a grounded-theory approach to collect data.

This concluding chapter is structured into five sections. Section 2 will answer the central research questions and summarize the key findings. Section 3 aims at providing insights on how to reach sustainable ocean use in contemporary Chinese society. Section 4 shifts the attention from China to the wider global context and discusses how the Chinese experience can contribute to dealing with global sustainability challenges in the oceans. Section 5 addresses the scientific contribution of this research, makes reflections on the shortcomings, and suggests future directions on research in this field.

6.2 Key findings related to the central research questions of this dissertation

6.2.1 How do people in coastal Chinese society understand marine life and marine life protection? And what are the influential factors that shaped such public attitudes?

Chapter 2 and chapter 3 are both engaged in answering these research questions from different angles. Chapter 2 portrays a general image of how coastal Chinese understand marine life and associates this public understanding with individuals' moral ideologies. Chapter 3 further illustrates this public perception of marine life from the perspective of environmental concern and links it to one's core environmental values. The investigation of our first central question was accomplished by a questionnaire composed of demographics questions and several Likert scales: a revised version of the Animal Attitudes Scale (AAS) was adopted to evaluate public attitudes towards marine life; ethical Ideology and core environmental values were calculated by the Ethical Position Questionnaire (EPQ) and the New Ecological Paradigm (NEP) respectively.

Generally speaking, citizens in coastal Chinese society hold positive attitudes towards marine life and marine life protection. People are largely aware of the importance of marine life protection, which corresponds to results from previous research indicating the Chinese hold friendly attitudes to animals and animal welfare (Su & Martens, 2017). Although comparing to

men, women are found to be more concerned about marine life in coastal China, such gender difference can also turn into the completely way in certain age groups. That is to say, the interaction between age and gender plays a role in influencing how people perceive the use of marine life. For the variable of age, despite some literature indicating its impact on marine life attitude, shows no association with how people understand marine life in this research project. The seniors and the youth exhibit rather a similar level of awareness of marine life protection. Within the several usages specifically pointed out in the questionnaire (food, medical research, hunting/fishing, use of skin/fur, slaughter), coastal Chinese feel the least acceptable of using the skin or fur (from seals and sea otters, for example). Comparably, coastal Chinese find it relatively more tolerable of using marine life for food (i.e. fish, shrimps) or medical research within these five usages.

How coastal Chinese citizens perceive the use of marine life is shaped by several human factors. The first one is ethical ideology. Idealistic morality is positively correlated with attitudes towards marine life and relativistic morality correlates negatively. The more people believe in good actions will lead to good results, the more concerned they feel about marine life protection. The more people question the existence of universal moral standards, the less friendly they are towards marine life using. The absolutists, individuals who consider ethical behavior result in good consequences but also conform to universal moral principles, are the most friendly group to marine life among all four ethical positions (subjectivistis, situationists, and exceptionists). For the different uses of marine life, idealistic morality is associated with public attitudes to hunting/fishing, use of skin/fur, and slaughtering marine life. Relativistic morality is interrelated with the using marine life for food and hunting/fishing. Neither of the two ethical dimensions is associated with using marine life in medical research. The second influential factor of marine life attitudes is environmental concern. Five dimensions of the NEP scale (the reality of limits to growth, anti-anthropocentrism, the fragility of nature's balance, rejection of exemptionalism, and the possibility of an eco-crisis), are all positively interrelated with how people understand marine life among coastal citizens in China. The more people endorse an eco-centric worldview, the more positive they are towards marine life protection. The more people believe in an anthropocentric worldview, the less friendly they are towards marine life. Within the five dimensions of environmental concern, the "anti-anthropocentrism" dimension is correlated with using marine life for food, hunting/fishing, and medical research. Lastly, public attitudes towards marine life are also uncovered to be associated with several human demographics or personal lifestyles. Companion animal caretakers (rodents caretakers especially), freelancers, religious beliefs (Catholicism especially), beach visits, NGO membership/donation, and transportation preferences are all predictors of marine life attitudes in coastal Chinese society.

6.2.2 How do people in coastal Chinese society understand offshore oil and gas drilling?

The second central research question aims at exploring how coastal citizens perceive the exploitation and utilization of marine energy resources in China. Chapter 4 looks into the public

support to offshore oil and gas development, the perceived risks associated with offshore oil and gas drilling, and the trust people have in different scientific statements on offshore drilling. The questionnaire employed in this chapter, in the same dataset with former chapters, includes questions collecting demographical information and offshore drilling attitudes from Michaud et al. (2008).

Public support to offshore oil and gas drilling remains at a low level in coastal Chinese society. This low support does not depend upon the location where offshore drilling is taken place, as none of the drilling sites mentioned in our questionnaire (in the current residential city, in remote areas, in/near national marine nature reservation areas) received more than 30% of support from the respondents. In addition, only about 15% of answers to "expanding offshore oil and gas drilling on Chinese coasts" are positive ("agree" and "strongly agree"). Although the low support to offshore oil and gas drilling stays consistent regardless of drilling location, coastal residents' opposition varies upon different drilling sites in coastal Chinese society. Compared to remote areas, offshore drilling in their current residential city received a significantly higher objection rate from our respondents. Now that the difference is statistically significant, it can be concluded that a NIMBY (not-in-my-back-yard) mentality exists in coastal citizens' attitudes towards offshore oil and gas drilling in China.

In line with the low public support, coastal citizens sense high risks associated with offshore oil and gas drilling and cast different levels of doubt in scientific statements on offshore drilling. Results from our dataset imply that coastal residents think large-scale oil spill event occurs quite frequently (more than 60% of respondents believe that large-scale oil spills happened less than every ten years). Once a large-scale oil spill event happened, it will bring huge threats to human life (about 50% of the respondents) as well as marine life (about 70% of the respondents). Additionally, people also deem it true that contacting with unrefined oil will bring a serious risk of getting cancer (about half of the respondents). Regardless of some perceptions or recognitions that do not match scientific figures or evidence, it is apparent the public hold strong negative feelings regarding the risks associated with offshore oil and gas drilling. On the basis of that, people have more confidence in scientific claims that indicate offshore drilling is risky than safe. This is unvarying no matter the scientific claims come from environmental groups or the oil industry. While in terms of the information source, it is commonly acknowledged in coastal China that environmental groups are more trustworthy than the oil industry. This is also unchanging regardless of the content indicating offshore drilling is risky or safe. Judging by the answers throughout our dataset, coastal citizens hold moderate trust in different scientific information regarding offshore oil and gas drilling.

Public attitudes towards offshore oil and gas drilling are also uncovered to be associated with certain human demographics. For one thing, some demographical differences are present in how coastal residents understand offshore oil and gas drilling in China. Females and people who find religious beliefs are not important in life tend to be less pro-offshore oil and gas drilling than males and people who find them important. Concerning trust in offshore drilling

information, vegetarians and vegans have significantly lower confidence in scientific claims on offshore oil and gas drilling than people who consume meat daily. For another thing, women, self-employed occupation, religious attitude (important in life), and vegetarian/vegan are found to be predictors of public support to offshore oil and gas drilling. In coastal Chinese society, offshore drilling support is negatively correlated with women and vegetarian/vegan whilst positively interrelated with religious attitude (important in life) and self-employed occupation.

6.2.3 What are the cultural and historical origins of Chinese attitudes towards marine life and offshore oil and gas drilling in coastal Chinese society?

After describing how coastal citizens perceive the use of marine biological as well as energy resources, the next step is to explain why people hold these attitudes in Chinese society. Especially, our investigation in chapters 2, 3, and 4 has come across some interesting findings, such as the relatively tolerable attitudes towards using marine life for food and medical research as well as the NIMBY mentality in offshore oil and gas drilling. Building on these discoveries, chapter 5 digs into the origins of public attitudes towards ocean use in the social context of China. A grounded theory method was applied based on results from three previous chapters and some existing literature. Looking through both historical and cultural perspectives, we provide answers that why coastal Chinese understand marine life and offshore oil and gas drilling in certain ways.

How individuals view the use of marine life and offshore oil and gas drilling reflects three worldviews prevailing in Chinese society: anthropocentrism, collectivism, and pragmatism. The anthropocentric worldview is negatively correlated with public attitudes towards marine life. It is also a predictor of certain marine life usages, like food, hunting/fishing, and medical research. Collectivism is not directly linked to marine life attitudes or offshore drilling attitudes in China. While a collectivistic worldview is in accordance with the concerns for the welfare of others in idealistic morality and the high risk-perception of damages from environmental disasters to the community. In that case, collectivism is also embedded within the concerns for marine life protection and offshore resource drilling. Likewise, pragmatism is also not directly connected with attitudes towards ocean resource use. But the moral relativism incorporates the rejection of universal moral standards but prefers to act upon specific situations (Forsyth, 1992), which is in line with a pragmatic worldview. In addition, the NIMBY (not-in-my-back-yard) mentality in offshore oil and gas drilling, the relatively tolerable attitudes towards consuming and medical researching of marine life are all related to a pragmatic worldview.

Anthropocentrism, collectivism, and pragmatism are deeply rooted in the agriculture-based ancient Chinese society and Confucianism-centered traditional Chinese culture. From a historical outlook, China has been an agrarian society for thousands of years in which agriculture production predominated all aspects of social life (Lee, 1921). The anthropocentric inclination was generated from the hardships in an agrarian society and social norms and beliefs that are grounded on farming activities. The hardships in an agrarian society, together with the needs for cultivation production and grassroots governance, have also fostered the

collectivism inclination in ancient China. Similarly, agriculture production entails making full use of the environment, which laid a solid foundation for the raising of a pragmatic inclination in ancient China. From the aspect of culture, Confucianism-centered traditional Chinese culture has greatly promoted the prevailing of anthropocentrism, collectivism, and pragmatism in Chinese society. Confucianism is the cornerstone of traditional Chinese culture and a mundane philosophy that values human activities in the secular world (Tang, 1995; Yao, 2000). The pursuit of '*junzi*' (superior person) role model and moral codes of '*ren*' (benevolence) and '*li*' (ritual) demonstrate that Confucianism philosophy is intrinsically anthropocentric. For collectivism, Confucianism puts emphasis on the significance of families and communities and establishes '*zhong*' (loyalty) and '*xiao*' (filial) as two central virtues. Lastly, Confucianism address following '*tao*' (the way) and '*zhongyong*' (doctrine of the mean) to recognize the world, which reflects the key messages of pragmatism in China. Taoism and Buddism, as two other philosophies which exerted influence on traditional Chinese culture, have further amplified pragmatism in Chinese society.

6.2.4 Other findings

In addition to public attitudes towards marine life and offshore oil and gas drilling, our research also uncovered some interesting findings regarding coastal citizens' moral ideology and environmental concern in China. For moral ideology, it is discovered that ethical idealism is positively correlated with ethical relativism in coastal China. The more individuals believe good actions will always lead to desirable consequences, the more they question the existence of universal moral standards. There is no significant difference between males and females in neither ethical idealism nor ethical relativism. While people who consider religious beliefs important in life score significantly higher than their counterparts in both ethical idealism and ethical relativism. Among four ethical positions, the situationist makes up the largest share while the subjectivist accounts for the smallest group throughout the dataset. For environmental concern, results from our survey show that coastal citizens have a good awareness of environmental protection. Nevertheless, they are also relatively passive in participating environmental conservation activities. Even though the respondents feel highly concerned about all five dimensions of NEP, the dimension "rejection of exemptionalism" receive comparably weaker concern from the respondents. Besides, men, north China citizens, car owners, and people who believe religious beliefs important in life are found to be less concerned about environmental degradation than their equivalents (females, south China citizens, people who own no car, and people who deem religious belief not important in life).

6.3 Insights for sustainable human use of the oceans in China

6.3.1 Promoting sustainable human use of the oceans

Promoting sustainable ocean use has its solid social base in China, as the public is mostly aware of the significance of marine biological and energy resources. Of the three dimensions of

sustainable development – environmental, economic, and social – the social dimension consists of the concept of awareness for sustainability and relates to different sustainability educational programs (Murphy, 2012). Raising public awareness or acceptance of sustainability issues is often seen as the prerequisite to reaching social sustainability (Borawska, 2017; Wood et al., 2016). Results from the present study have demonstrated that the public in coastal Chinese society takes friendly attitudes towards marine life, has a good awareness of environmental conservation, and holds low support to drill offshore resources. It can be concluded that public awareness of sustainability stays at a good level in coastal Chinese society. This fact builds a sturdy social base for promoting sustainable use of the oceans in coastal China. Chances are high that raising coastal citizens' awareness of sustainability will not conflict with existing social norms and values in coastal Chinese society. There requests fewer endeavors to increase public awareness of the significance of marine life protection and environmental conservation. Instead, more specific knowledge and information and concrete measures to protect marine life are in demand. For example, since many people already find the slaughter of whales is not acceptable, telling them whales should not be hunted or slaughtered is less of an emergency. But the society may want to know why certain whales (such as the sperm whales) are often the target of hunting (for sperm oil) and what people can do to protect them from being killed. What also worth noting is, it is not our intention to argue there is no need to raise public awareness of sustainability at all. As this research cannot guarantee every societal member understands ocean use in the same way, continuous efforts on establishing correct beliefs and increasing public knowledge about human use of the oceans are still necessary.

"The greater good" can serve as a good strategy for promoting sustainable ocean use. An interesting finding from this research lies in the relatively tolerable attitudes towards using marine life in medical research despite the good awareness of marine life protection on the whole, corresponding to existing literature that laboratory use of animals is somewhat acceptable for the Chinese (Su & Martens, 2017; Su et al., 2022). As explained in chapter 5, this stems from anthropocentrism, collectivism, and pragmatism mentalities that are deeply rooted in ancient Chinese society and traditional Chinese culture. In view of these three mentalities, relative tolerance can also be perceived as a concern for the greater good in Chinese society. Compared to the progress of medical science, the possibility of saving people's lives, and the development of social and medical welfare, sacrificing marine life in medical research can be considered less of a problem. In another word, as long as the greater good serves as the end, using marine life in medical research is justifiable. Not to mention the use of marine life in traditional Chinese medicine can date back more than two thousand years ago (Ni, 1995). Given that the greater good justifies the medical research of marine life, strategically phrasing "the greater good" may make a difference in public attitude. At the moment, the greater good refers to the progress of medical science, the possibility of saving people's lives, and the development of social and medical welfare in the context of Chinese society. However, if framing the greater good from a sustainability perspective, citizens' attitudes may be converted into a pro-environmental mindset. For instance, when species and biodiversity conservation is identified

as the greater good, consuming and laboratory use of marine life will turn into a bigger issue for the public; when the harmonious coexistence between humans and nature is understood as the greater good, transforming and altering marine environment can be unacceptable for individuals as well; if avoiding to reach the planetary boundaries is seen as the greater good, people would expect human uses of the oceans to be cautious and sustainable. For promoting and achieving sustainable human use of the oceans in Chinese society, the greater good should be a better planet, the welfare of all living creatures, and the harmonious coexistence between humans and nature.

6.3.2 For marine fishery resources, balancing human needs and marine life protection is significant

First and foremost, setting boundaries are momentous in terms of different uses of marine biological resources on human needs side. Our research uncovered that the public finds it relatively acceptable with consuming marine fishery resources (fish, shrimps, crabs, etc.) notwithstanding the overall good awareness of marine life protection in Chinese society. Taking into account the present challenge of fishery resource depletion, there have to be boundaries concerning marine fishery captures and consumption in Chinese society. Marine fishery resource should be able to meet the needs of current society but also stays adequate and healthy for future generations. The boundaries are associated with how marine fishing activities ought to be carried out and monitored. From both time and space aspects, a series of moratoriums will be able to draw the lines for how marine fishing can be performed. This includes but is not limited to seasonal moratoriums (fish ban in certain seasons), regional moratoriums (fish ban in certain water areas), and species moratoriums (fish ban on certain species). From the aspect of frequency and intensity, there should also be regulations on how much marine fishing and hunting are allowed. Policy-making can go through different dimensions of fishing activities, such as the depth below surface water, the distance from coasts, and the suggested maximum amount of fishery captures. In addition, limitations should be set on human recreational activities, like sports fishing and whale watching, to minimize the man-made impact on marine life. From the aspect of fishing techniques, formulating stricter principles on fishing gears, tools, and equipment can also regulate the development of marine fishing and hunting. The principles relate to what tools are permitted in marine, or even deep-ocean, fishing, like the materials of fishing hooks and nets, the size of the grids on the fishing net, and the design of the net or gears. Different fishing tools are supposed to guarantee the safety and efficiency of marine fishing, but more importantly, leave space for small animals, like fish fry and shrimp larvae, to escape and grow in the oceans. In a word, boundaries help conduct marine fishing sustainably.

On the marine life conservation side, shifting public perception from anthropocentric to eco-centric and bio-centric ought to be the priority in contemporary Chinese society. Based on findings in chapter 3, the more people support an eco-centric worldview, the more positive they are towards marine life protection. Oppositely, the more people favor an anthropocentric viewpoint, the less concerned they are over marine life protection. On account of the

agriculture-based ancient society and Confucianism-centered traditional culture, as indicated in Chapter 5, the anthropocentric, collectivistic, and pragmatic mentalities are innately embedded within the mindset of Chinese people. Such a mindset contradicts with the efforts from Chinese government and society on ocean protection and marine life conservation. Shifting the mental inclination from anthropocentric to eco-centric and bio-centric is the priority among priorities in modern Chinese society. It is imperative for the public to recognize that human beings share the oceans and coexist on earth with many other living creatures, rather than ruling nature and controlling the flora and fauna on this planet. Transforming the anthropocentric inclination can be facilitated via several paths in Chinese society: mass media (newspaper, TV programs, internet, etc.), governmental policies, educational programs, industry regulations, and so forth. No matter in which path, the information delivered to the public should be carefully phrased and framed to avoid anthropocentric indication. For instance, when introducing a marine mammal to the public, instead of presenting what their skin or fur can be made into or which part of their bodies has medical values, it is more appropriate to illustrate what living environment will be suitable for them and how far are we in protection these marine animals. Once individuals no longer view themselves as “ocean rulers”, can we achieve sustainable human use of the oceans.

Sometimes, looking for supplements and developing substitutes act as better solutions to human use of marine biological resources. In the present research, it is discovered the public feel less concerned about consuming marine life in China. While in our questionnaire, the consumed marine life was specified as fish, shrimp, crabs, etc. These marine life are also conventionally recognized as seafood and cultivated manually, namely, in marine aquaculture. In a way, marine aquaculture becomes a good supplement for marine captures, particularly under the global background of fishery resource depletion (Goldburg & Naylor, 2005). Provided with proper control of pollutants discharging, marine aquaculture is both environmentally friendly and economically beneficial to society, not to mention its vast potential for development globally (Feng et al., 2004; Gentry et al., 2017; Wu, 1995). Next to consuming marine life, our research also found out the Chinese feel medical use of marine life more or less acceptable. Considering the long history of traditional Chinese medicine, it seems difficult to change such public attitudes in China. Yet, seeking substitutes or developing alternative approaches offers a sustainable way out. Rather than using products from living marine life, some ingredients can be artificially synthesized or derived from other non-endangered species in a harmless way. As a matter of fact, nowadays, some pharmaceuticals from traditional Chinese medicine are already using artificially bred or synthesized ingredients that used to be extracted from wild animals or herbs only, such as the caterpillar fungi and musk (Cheung et al., 2021; Li et al., 2019; Lv et al., 2022). Substitution with artificial and synthesized products present a promising possibility to achieve sustainable human use of the oceans in China.

6.3.3 For marine energy resources, establishing correct understanding of offshore drilling is the key

Formulating rational and reasonable recognition of risks associated with offshore oil and gas drilling is essential for developing offshore energy projects in coastal China. Same as the local residents on California coasts (Michaud et al., 2008), results from this research reveal that coastal Chinese tend to overestimate both environmental and health risks associated with offshore oil and gas drilling. Indisputably, offshore oil and gas drilling inherently incorporate the dangers or risks of oil spills, which could give rise to devastating impacts to the marine ecosystem and local residents. But, risks are eternal. The last thing people should do is to give up eating for fear of choking. Rational understanding of "*the choking*" (risks) benefits "*the eating*" (offshore oil and gas drilling) while irrational understanding only impairs. Especially, neither scientific evidence nor official records could support coastal citizens' recognition of the frequency of large-scale oil spills and health threats to human beings. It can be concluded much of coastal citizens' perception of offshore drilling risks are, eventually, over-exaggerated in coastal China. To develop coastal energy projects and relieve the pressure of inland energy resources, establishing rational and reasonable recognition of offshore oil and gas drilling lies in the first place. Rational and reasonable recognition of offshore drilling relates to the environmental and health risks associated with offshore oil and gas drilling and the frequency and severity of potential oil spills triggered by offshore drilling. Moreover, rational and reasonable recognition of offshore drilling also links to the preparation and corresponding plans once oil spills happened, the risk management strategies from local government and operating oil firms, and so on. These two sides basically refer to "what can go wrong" and "how to make it right again". Only when individuals have a correct understanding of both the risks and the measures responding to the risks, can they stop exaggerate the risks of offshore oil and gas drilling, and, even possibly, increase their support for coastal energy development.

Policy making and implementation have to carefully deal with the low support to offshore drilling, but also make use of the nimby mentality and moderate trust in offshore drilling information from the public. Results from Chapter 4 indicate that coastal residents hardly support offshore oil and gas drilling regardless of the drilling locations, whilst holding a nimby mentality in opposition to offshore drilling and a moderate amount of confidence in scientific statements. For utilizing offshore energy resources smoothly, there are certain issues policy making and implementation, especially local governmental level, should take seriously. Firstly, on account of the low public support to offshore oil and gas drilling, carrying out future coastal energy projects may encounter environmental protest from civic society or trigger huge societal debate. Local government should fully be prepared for not only utilizing offshore energy resources but also corresponding plans to ease public opposition. Secondly, considering the nimby mentality, the sites of drilling projects ought to be thoroughly discussed and cautiously determined. The ideal drilling sites would be somewhere appropriate for drilling operation but far from coastal inhabitants, although in reality, this may be difficult to guarantee for both sides. Thirdly, the moderate trust in scientific statements offers room for policymakers and

governments to shape public attitudes towards offshore oil and gas drilling. Especially combined with scientific figures and evidence, coastal citizens' perception of offshore drilling risks, social and economic meanings, etc. are all possible to be re-shaped and formulated.

6.3.4 Further indications for policy making

From a broader policy context, our research outcomes also bring policy implications to certain areas that are related to sustainable human use of the oceans. The first one is animal (marine life) welfare. Animal welfare refers to "*the physical and mental state of an animal in relation to the conditions in which it lives and dies*" (OIE, 2019). Living in a safe and healthy environment without suffering or unpleasant experiences is an important indication of good animal welfare (OIE, 2019). Our research discovered the slaughter of marine mammals and using their skin or fur are considered as the least tolerable for coastal Chinese. Obviously, the public is not only aware of the cruelty and inhumanity of such behavior and treatment to marine life but also holds deep concern towards these usages in coastal Chinese society. Although animal welfare or marine life welfare has not yet developed into a major issue on the policy agenda, it can be expected that legislations on these marine life usages, such as banning the slaughter of marine mammals and using their skin or fur for commercial ends, will receive wide social support in coastal China.

The second one is coastal energy development. All over the world, oil and gas drilling is not the only form of energy development off the coasts. Other types of coastal energy projects include offshore wind farms, nuclear power plants, incineration power plants, and so forth. Results from this research have informed that the public is unwilling to support offshore oil and gas drilling in coastal Chinese society and holds a nimby mentality in their mindset. But such low-level support and nimby mentality are not exclusive to offshore oil and gas drilling. Earlier studies on offshore wind energy, nuclear power, and incineration power development in coastal China also observed such opposition and nimby mentality (Guo et al., 2015; Huang & Yang, 2020; Huang et al., 2015; Sun & Zhu, 2014). Putting all information together, it can be inferred that coastal citizens are unenthusiastic about any form of offshore energy development in China. For policymakers and local governments, how to deal with local opposition to offshore energy projects should be attached as much importance as (if not more) the design and implementation of these projects. Right from the start, policy making should integrate plans to alleviate public anxiety towards coastal energy projects and establish correct understanding of offshore energy development before local opposition turns into environmental protests.

The third one relates to marine spatial planning. The gist of marine spatial planning lies in managing the use of ocean space and guiding the interactions between human activities and marine environment in a practical way (Ehler & Douvere, 2009; Santos et al., 2019). The present research found out human contact with nature, like beach visiting, is a predictor of attitudes towards marine life protection and associated with how people view the different usages of marine life. Additionally, there is a nimby mentality in coastal citizens' attitudes towards

offshore oil and gas drilling. These findings all point to one issue – location matters in public attitudes towards different ocean resource uses, which corresponds to the kernel of marine spatial planning. As a result, it made our results also insightful for marine spatial planning policymakers. On the one hand, decision-making on offshore oil and gas projects can take advantage of the nimby mentality of the coastal citizens and look for drilling sites which are located far from large residential neighborhoods. On the other hand, policy makers should also establish marine conservation areas to restrict human intervening in the marine environment. There should be limits for working at sea in any offshore industry involved (fishing, drilling, tourism). Besides, spaces for individuals to visit the seaside and interact with the oceans are of vital importance in coastal Chinese society. They are necessary means for the public to stay connected with the oceans.

Over the past decades, a series of measures has been taken by the Chinese government to facilitate the sustainable use of marine resources. Since 1995, an annual summer moratorium on marine fishing has been implemented in the coastal waters of China, which enforces harsh regulations on the fishing time, water areas, fishing vessels, and tools. Until 2018, there are in total of 271 marine nature protection zones (covering over 124,000 square kilometers) on the Chinese coasts in which protecting marine ecosystem and endangered marine life are their main aims (Hu et al., 2020). During the past decades, marine aquaculture is also rapidly growing in China where sustainably transferring to a low input and high output aquaculture industry is also gradually realizing at the same time (Zhao et al., 2021). Undoubtedly, the great efforts from the Chinese government has seriously relieved the burden of wild fishery captures and regulated different human uses of ocean resources. Nevertheless, considering the market needs remaining to be high and wild fishery resources continuing to deplete, coastal Chinese society is still confronted with the pressure of multiple sustainability challenges. The way to achieve sustainable human use of the oceans in coastal Chinese society is promising but full of difficulties.

6.4 Insights for sustainable human use of the oceans worldwide

Ethical ideology, particularly ethical idealism, is an important indicator of attitudes towards marine life use. Over the past decades, a growing body of literature has documented the relationship between moral ideology and human attitude towards non-human animals. Idealistic morality is found to be positively correlated with public attitudes towards animal use in different countries, such as China, the U.S., the Netherlands, and Japan (Galvin & Herzog, 1992; Su et al., 2018; Su & Martens, 2017, 2018). No matter in which country, the more people believe in good behavior will bring about positive results, the more concerned they feel towards the use of animals (including marine life). In fact, ethical idealism inherently incorporates the concern for the welfare of others and the expectation of an idealistic world without any harm (Forsyth, 1992). Consequently, it came as no surprise that highly idealistic

individuals are better aware of animal welfare and marine life protection. As a predictor of marine life using, ethical idealism has unique meanings under the global challenge of sustainability. There is a good chance that people with high idealistic morality will smooth the path to sustainable human use of the oceans. They can be decision makers who formulate the marine fishing policies; or scientists who research ocean warming and acidification; or just ordinary consumers who are surrounded by commodities made of ocean resources. They are the public who determines what human needs are and how should human treat marine life.

Anthropocentrism, especially the anthropocentric ecological outlook, is adverse to sustainable human use of the oceans. Findings from the present research showed that the anthropocentric ecological outlook is negatively correlated with attitudes towards different marine life use. The more people deem themselves as superior to any other thing on this planet, the less problematic they find in utilizing marine life for different aims. Seeing the current depletion of marine fishery resources and increasingly deteriorating ocean environment, the anthropocentric ecological outlook will only justify the unsustainable ocean use and make the harsh situation even worse. On the contrary, when people consider the ecosystem or the biosphere as the most important in this universe, the coexistence between human beings and nature as well as all other forms of living creature becomes the top priority. Evidently, in order to achieve sustainable human use of the oceans, people should completely abandon anthropocentric thinking and foster an eco-centric or bio-centric mentality. Nevertheless, in the continuum between anthropocentrism and eco-centrism or biocentrism, most individuals are just standing somewhere close to the middle other than the extremes. To some social scientists, the anthropocentric inclination is also reckoned as inevitable and natural in the human mindset (Grey, 1993). It is unrealistic to expect all human beings turning into exclusively eco-centric or bio-centric. However, abandoning the “ocean ruler” identity and setting boundaries on human needs, as aforementioned, are both feasible and achievable to many people in this world. The less anthropocentric individuals can be, the more likely to reach sustainable human use of the oceans.

In addition to idealistic morality and anthropocentrism, social and cultural context matters in achieving sustainable human use of the oceans. Taking China as an example, Confucianism is the core of traditional Chinese culture (Tang, 1995). Confucianism philosophies have helped explain not only why the Chinese find it relatively tolerable to use marine life for consumption and medical research, but also the negative correlation between ethical relativism and public attitudes towards marine life. Interestingly, previously animal attitude studies also discovered that the negative correlation between relativistic morality and attitudes towards animals only exists in China and Japan but not in western countries (Galvin & Herzog, 1992; Su et al., 2018; Su & Martens, 2017, 2018). Taking into account that Confucianism has deeply influenced both Chinese and Japanese culture (Tang, 1995; Wargo, 1990), the role of cultural context in affecting human attitudes towards marine life may be larger than people thought. For social context, the moderate trust in offshore drilling information in coastal China has illustrated its importance. As Chapter 4 analyzed, coastal citizens find these offshore drilling claims

trustworthy not because of their sources but due to the trust in the "scientist" identity because scientists are customarily identified as prestige and professional in Chinese society (CRISP, 2010; Hongbin et al., 2008; Zhongliang, 1991). Similarly, the different public attitudes towards offshore oil and gas drilling between residents from California coasts and Louisiana coasts also illustrate the significance of social context in offshore energy developing. Offshore drilling projects usually receive much more intense opposition on California coasts than Louisiana coasts in that the starting time (offshore oil drilling was initiated much earlier on Louisiana coasts) and the connection with the local community (most local residents count on the oil industry to make a living) act as two of the leading factors (Freudenburg & Gramling, 1993).

6.5 Scientific contribution, reflection on limitations, and future research directions

6.5.1 Scientific contribution of this research

This dissertation fills in the scientific knowledge gap of how coastal Chinese people perceive their utilization of different marine resources. For a long time, very limited information is available in the academic world concerning how people in the Global South, China in particular, understand the uses of the oceans. To the best of our knowledge, this research serves as the first study investigating public attitudes towards marine life and public attitudes towards offshore oil and gas drilling in coastal Chinese society. It has depicted general images regarding how Chinese people understand the use of marine life and offshore drilling projects. Owing to that, our research can be regarded as a starting point for researching sustainable human use of the oceans in China. Especially, our research method, integrated assessment, enables our analysis of human attitudes from multiple perspectives (social, cultural, environmental, etc.) and our discussions of sustainable ocean use under the unique context of ancient Chinese society and traditional Chinese culture. Additionally, findings from this research provide insights into how to deal with the increasingly serious sustainability challenges in contemporary Chinese society. In responding to the growing societal concern over the degradation of the marine environment, this research deepens our recognition of the urgency and severity of unsustainable ocean use and indicates a direction for reaching sustainable human use of the oceans.

By highlighting the influential factors, the present research contributes to how to examine and explain human attitudes towards marine life and offshore oil and gas drilling. In this dissertation, special attention was given to the roles of ethical ideology and environmental values in shaping public attitudes towards marine life. On the basis of our results, combined with existing literature, we believe that both morality and environmental values should be taken into consideration when researching human attitudes towards marine life protection. It is suggested to involve morality and environmental values in marine life attitude studies as they are helpful to interpret the differences among the public. Similarly, given our findings, it is recommended

to include the nimby mentality and risk perception in offshore drilling attitude research. For their involvement will benefit not only describing a more detailed story of public support to offshore oil and gas drilling but also the interpretations of different stakeholders. The correlations we discovered between public attitudes and ocean use can be insightful and useful for social scientists looking into other communities or regions all over the world. In a nutshell, this dissertation also contributes to the literature by discovering the factors associated with human attitudes towards different ocean resource utilization.

6.5.2 Reflection on limitations of this research

Throughout the dissertation, a certain degree of success is made in researching sustainable human use of the oceans in coastal Chinese society. Nonetheless, it is undeniable that our research, like plenty of other scientific studies, is not perfect. There are also limitations and imperfections which remind us to read the results cautiously and avoid jumping to absolute conclusions. The social science perspective, as we choose to start with in this research, has its intrinsic shortcomings. Compared to natural science disciplines, one major weakness of social science perspectives is its less accuracy in measurement but more ambiguity in deduction (Bhattacherjee, 2012). For instance, although we discovered that ethical idealism is associated with public attitudes towards marine life using, it is not possible to determine to what percentage human attitude is influenced by idealistic morality. There is no correct answer as it varies from person to person. Likewise, despite a fishing moratorium is recommended as a coping strategy for the depletion of fishery resources, we are unable to specify the details of such moratoriums (how much time should it be, how big the water areas should be; what sizes of boats and nets are supposed to be banned). More biological and oceanographic knowledge is required to formulate the appropriate decisions. They are beyond the scope of social science research.

Every research method has its advantages and disadvantages, and this is no exception with our online survey. It is well-known that the questionnaire method is suffered from sampling bias (Bhattacherjee, 2012). In the most ideal scenario, researchers can deal with a sample that includes more or less the same numbers of respondents from all walks of life, like men and women, the youth, the middle-aged, and the elderly. But this is often not the case in reality. Even though our online questionnaire guaranteed the survey will be carried out in a fast and cost-effective way, it also gave rise to a highly disproportionate research sample. There are considerably fewer respondents from rural area citizens than urban area citizens and far fewer people from the elderly than the youth. This might explain why we did not uncover any age difference or urban-rural difference throughout the dissertation, in spite of earlier literature indicating such differences. It is also noteworthy that there is a timing issue since our survey was conducted in late 2018. During the past two years, the Covid-19 pandemic also seriously influenced everyone's life across the globe. People's attitudes towards human use of the oceans, possibly related to marine life use, may be affected meanwhile. While seeing human attitudes are constantly changing, the credibility and validity of our research outcomes remain unimpaired.

6.5.3 Suggestions on future research directions

Sustainable human use of the oceans is an urgent and complicated topic. Enormous endeavors and engagement from the scientific community are required if we want to end all the unsustainable human use of the oceans. We, as researchers from this research project, would like to encourage more social scientists to look into this area and contribute to sustainable human use of the oceans. Judging by results from the present research, we recommend the following research directions to further explore sustainable human use of the oceans: 1. Human attitudes towards marine life and offshore drilling from the elderly and rural area residents in coastal China. The aim is to complete this missing link to our story. Since our online survey failed to get in touch with these societal members, other research methods, such as paper or phone based questionnaires, interviews, and focus groups, are suggested as alternatives to connect with them. 2. Influence of the Covid-19 pandemic on public attitudes towards ocean use in coastal China. The Covid-19 pandemic is the most significant global concern during the past 2-3 years. Research into public attitudes after the outbreak of the Covid-19 pandemic will portray the (possible) attitudinal change of the public and bring about new insights into sustainable human use of the oceans. 3. Human attitudes towards other types of ocean use, such as shipping, mining, tourism, and so on. Due to time and experience limits, only marine life using and offshore oil and gas drilling were selected to represent human use of the oceans in this dissertation. But there are many other varieties of human use of the oceans, for example marine shipping, deep ocean mining, and coastal tourism. Studies on other forms of ocean use may provide additional knowledge on public attitudes in China. 4. Social-economic analysis of human use of the oceans. Besides social and cultural factors, human attitudes towards ocean use may also be related to economic factors, like energy price and offshore drilling, willingness to pay for relocating drilling sites, etc. Findings from these potential studies will most likely deepen our understanding of sustainable human use of the oceans.

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Appendix: Questionnaire

Public attitude towards marine life and offshore oil drilling questionnaire

Cover letter

Dear participant:

This social survey is part of the research project "Human-Ocean relationship in Contemporary Chinese Society" led by Maastricht Sustainability Institute (MSI), Maastricht University, the Netherlands. The object of this social survey is to gain better understanding of public attitudes towards marine life and offshore oil drilling in contemporary Chinese society. We aim at answering the questions of what are the underlying factors that shape these attitudes in Chinese society. Thus, we would like to invite you to fill in this questionnaire. Based on your internal ideas and standing position, please indicate your perception regarding marine life and offshore oil drilling. The results of this survey will be used for increasing the conservation for marine life, creating a harmonious marine ecological environment, and proposing feasible suggestions for public and economic policies.

All the information you provided will be kept completely confidential. Your personal information will not be released to or viewed by anyone other than the researchers involved in this project. Results of this study will not include your name or any other identifying characteristics – unless you give the permission for that.

If you have any questions, during or after filling in this questionnaire, please contact Mo Chen (mo.chen@maastrichtuniversity.nl) or Prof. Pim Martens (p.martens@maastrichtuniversity.nl).

Thank you very much for your cooperation!

Mo Chen & Pim Martens

MSI, Maastricht University

Part I: Personal Details

Personal Information
1. What is your birth year? ____ (eg. 1972)
2. What is your gender?

a. Male b. Female
3. Which coastal city area do you currently live in? Liaoning Province: a. Dalian b. Yingkou Hebei Province: c. Qinhuangdao Tianjin City: d. Tianjin Shandong Province: e. Yantai f. Weihai g. Qingdao Jiangsu Province: h. Lianyungang i. Nantong Shanghai City: j. Shanghai Zhejiang Province: k. Ningbo l. Wenzhou Fujian Province: m. Fuzhou n. Xiamen Guangdong Province: o. Shantou p. Guangzhou q. Shenzhen r. Zhuhai s. Zhanjiang Guangxi Province: t. Beihai Hainan Province: u. Haikou v. Sanya
4. What is your current residence place? a. Urban areas (a geographical area constituting a city or town) b. Rural areas (an area outside of cities or towns)
5. What is the highest level of education you have completed? a. Less than high school b. High school c. Junior college program d. University bachelor degree e. Master degree and above f. Other____ g. No answer
6. What is the average income (X) per month per person in your household? a. X ⩽2,000 rmb/month b. 2,000 rmb/month < X ⩽ 4,000 rmb/month c. 4,000 rmb/month < X ⩽ 6,000 rmb/month d. 6,000 rmb/month < X ⩽ 8,000 rmb/month e. 8, 000 rmb/month < X ⩽ 10, 000 rmb/month f. 10, 000 rmb/month < X g. No answer
7. What is your occupation? a. Liberal profession b. Civil servant/ Public institute c. Employed (enterprise) d. Self-employed e. Retired f. Student e. Social welfare f. Other___ g. No answer

8. Is religion/spirituality important in your life? a. Yes b. No (go to question 10)
9. (Follow 8) If yes, then what is your main source of inspiration (multiple answers possible)? a. Buddhism b. Taoism c. Islam d. Christianity e. Catholicism f. Judaism g. Other____
10. Do you belong or donate to an organization or charity involved in or concerned with (multiple answers possible): a. Improving the welfare of animals b. Conservation of the natural environment c. Improving human rights or health d. Not belong or donate to any organization mentioned above
11. Do you own a (at least 1) pet(s)? a. Yes b. No (go to question 13)
12. (Follow 11) If yes, what pet do you have (multiple answers possible)? a. Cat(s) b. Dog(s) c. Fish d. Bird(s) e. Reptile(s) f. Rodent(s) g. Chickens, pigeon, geese (or other poultry) h. Ponies, horses i. Other____
13. How often do you eat meat (including fish) every week? a. I do not eat meat, I am a vegetarian/vegan b. Once a week c. 2-3 days a week d. 4-6 days a week e. Every day
14. How often do you visit a zoo or aquarium? a. Once a month or less than a month b. Once a half-year c. Once a year d. Once two years or more than two years e. Never
15. How often do you visit the beach?

a. Everyday
b. Once or twice a week
c. Once or twice a month
d. Once or twice a half-year
e. Once a year
f. Once two years or more than two years
g. Never (go to question 17)

16. While visiting the beach, which of the following options is the most important to you?
a. Natural environment (waves, sunshine, sands, etc.)
b. Beach sports (swimming, surfing, diving, etc.)
c. Leisure atmosphere (free of pressure, cute girls or boys around, etc.)
d. Recreational activities (photographing, barbecue, painting, etc.)
e. Others:____

17. Do you own a (at least 1) car?
a. Yes
b. No

18. Except for the necessity factors (distance, time, speed), which factor is more important to you when choosing transport means (car, metro, train, bus, bicycle, etc.)?
a. Environmental factor (waste gas emission, climate change, etc.)
b. Economic factor (oil price, ticket price, high-speed road fee, etc.)
c. Personal preference (more free space, need of privacy, showing social status, etc.)
d. Others:_____

19. Which of the following statements best describes your reading habit of oil and gas prices related news reports?
a. I never read these news reports even if they appear directly on TV or Internet news.
b. When they appear directly on TV or Internet news, I read these news reports roughly.
c. When they appear directly on TV or Internet news, I read these news reports carefully.
d. I actively search for and pay close attention to these news reports.
e. Other:____

20. Which of the following statements best describes your reading habit of clean energy (wind, solar power, etc) related news reports?
a. I never read these news reports even if they appear directly on TV or Internet news.
b. When they appear directly on TV or Internet news, I read these news reports roughly.
c. When they appear directly on TV or Internet news, I read these news reports carefully.
d. I actively search for and pay close attention to these news reports.
e. Other:____

Part II: Ethical Position Questions

Ethical Position Questionnaire
Please indicate if you agree or disagree with the following items. Each represents a commonly held opinion and there are no right or wrong answers. We are interested in your

reaction to such matters of opinion. Rate your reaction to each statement by writing a number to the left of each statement where: 1 = Completely disagree; 2 = Largely disagree; 3 = Moderately disagree; 4 = Slightly disagree; 5 = Neither agree nor disagree; 6 = Slightly agree; 7 = Moderately agree; 8 = Largely agree; 9 = Completely agree
1. People should make certain that their actions never intentionally harm another even to a small degree.
2. Risks to another should never be tolerated, irrespective of how small the risks might be.
3. The existence of potential harm to others is always wrong, irrespective of the benefits to be gained.
4. One should never psychologically or physically harm another person.
5. One should not perform an action which might in any way threaten the dignity and welfare of another individual.
6. If an action could harm an innocent other, then it should not be done.
7. Deciding whether or not to perform an act by balancing the positive consequences of the act against the negative consequences of the act is immoral.
8. The dignity and welfare of the people should be the most important concern in any society.
9. It is never necessary to sacrifice the welfare of others.
10. Moral behaviors are actions that closely match ideals of the most “perfect” action.
11. There are no ethical principles that are so important that they should be a part of any code of ethics.
12. What is ethical varies from one situation and society to another.
13. Moral standards should be seen as being individualistic; what one person considers to be moral may be judged to be immoral by another person.
14. Different types of morality cannot be compared as to “rightness.”
15. Questions of what is ethical for everyone can never be resolved since what is moral or immoral is up to the individual.
16. Moral standards are simply personal rules that indicate how a person should behave, and are not to be applied in making judgments of others.
17. Ethical considerations in interpersonal relations are so complex that individuals should be allowed to formulate their own individual codes.
18. Rigidly codifying an ethical position that prevents certain types of actions could stand in the way of better human relations and adjustment.
19. No rule concerning lying can be formulated; whether a lie is permissible or not permissible totally depends upon the situation.
20. Whether a lie is judged to be moral or immoral depends upon the circumstances surrounding the action.

Part III: New Ecological Paradigm Scale

New Ecological Paradigm

Listed below are 15 statements about the relationship between human beings and environment. Please tick your attitude towards each of these statements. We are interested in the extent you agree or disagree these statements.

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
We are approaching the limit of the number of people the Earth can support.					
Humans have the right to modify the natural environment to suit their needs.					
When humans interfere with nature it often produces disastrous consequences.					
Human ingenuity will insure that we do not make the Earth unlivable.					
Humans are seriously abusing the environment.					
The Earth has plenty of natural resources if we just learn how to develop them.					
Plants and animals have as much right as humans to exist.					
The balance of nature is strong enough to cope with the impacts of modern industrial nations.					
Despite our special abilities humans are still subject to the laws of nature.					
The so-called "ecological crisis" facing humankind has been greatly exaggerated.					
The Earth is like a spaceship with very limited room and resources.					
Humans were meant to rule over the rest of nature.					
The balance of nature is very delicate and easily upset.					
Humans will eventually learn enough about how nature works to be able to control it.					
If things continue on their present course, we will soon experience a					

major ecological catastrophe.					

Part IV: Animal Attitude Scale – Marine Life

Animal Attitude Scale – Marine Life

Listed Below are 20 statements regarding the use of marine life. Please tick your attitude towards each of these statements. We are interested in the extent you agree or disagree with them.

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
It is morally wrong to fish marine life just for sport.					
I do not think that there is anything wrong with using marine life in medical research.					
There should be extremely stiff penalties including jail sentences for people who participate in shark finning.					
Marine life, such as seals and sea otters, should not be killed and their skins made into fur coat.					
There is nothing morally wrong with fishing marine life for food.					
I think people who object to cultivating marine life for meat are too sentimental.					
Much of the scientific research done with marine life is unnecessary and cruel.					
I think it is perfectly acceptable for fish and shrimps to be raised for human consumption.					
Basically, humans have the right to use marine life as we see fit.					
The slaughter of whales and dolphins should be immediately stopped even if it means some people will be put out of work.					
I sometimes get upset when I see marine life in water tanks at					

aquariums.					
In general, I think that human economic gain is more important than setting aside more water areas for marine life.					
Too much fuss is made over the welfare of marine life these days when there are many human problems that need to be solved.					
Breeding fish for caviar is a legitimate use of marine life.					
Some aspects of biology can only be learned through dissecting preserved marine life such as dolphins.					
Continued research with marine life will be necessary if we are to ever conquer disease such as cancer, heart disease, and AIDS.					
It is unethical to spend huge money on ornamental fish for pets when millions of fish are killed in polluted ocean areas each year.					
The production of inexpensive crabmeat, prawns, and dry seafood justifies maintaining marine life under crowded conditions.					
The use of marine life such as extracting elements from deep-sea fish for cosmetics and healthcare products is unnecessary and should be stopped.					
The use of marine life in aquariums and indoor performance (such as dolphin shows) is cruel.					

Part V: Oil drilling attitude

Listed below are 14 statements or questions about offshore oil drilling attitude. Please give your answers towards each item. There are no right or wrong answers. We are interested in your reaction to such matters of opinion.

1. Oil companies should be allowed to drill more oil and gas wells in offshore areas along

Chinese seacoasts. a = Strongly disagree; b = Disagree; c = Unsure; d = Agree; e = Strongly agree
2. Suppose a new offshore oil drilling platform were planned to be built off the coast of your city, near the area you are currently living in. Would you support or oppose its construction? a= Strongly oppose; b = Oppose; c = Unsure; d = Support; e = Strongly support
3. Suppose a new offshore oil drilling platform were planned to be built in a remote area off the coast of your city? Would you support or oppose its construction? a = Strongly oppose; b = Oppose; c = Unsure; d = Support; e = Strongly support
4. The Chinese central government should allow oil drilling in or near the National Marine Nature Reservation Areas. a = Strongly disagree; b = Disagree; c = Unsure; d = Agree; e = Strongly agree
5. In your opinion, how often would a large-scale oil spill happen in Chinese coastal areas? a. Every 5 years; b. Every 10 years; c. Every 20 years; d. Every 40 years; e. More than 40 years
6. In your opinion, if a large-scale oil spill occurs, how much threat does it pose to human life? a. A great deal; b. Some; c. Only a little; d. None at all; e. I don't know
7. In your opinion, if a large-scale oil spill occurs, how much threat does it pose to marine life? a. A great deal; b. Some; c. Only a little; d. None at all; e. I don't know
8. In your opinion, how much risk does contacting with raw, unrefined petroleum cause of getting cancer? a. Serious risk; b. Moderate risk; c. Slight risk; d. No risk at all; e. I don't know
9. How much confidence do you have in statements made by oil industry scientists about potential health risks associated with living near an oil drilling site? a. Almost no confidence at all; b. Only some confidence; c. A moderate amount of confidence; d. A great deal of confidence
10. How much confidence do you have in statements made by environmental group scientists about potential health risks associated with living near an oil drilling site? a. Almost no confidence at all; b. Only some confidence; c. A moderate amount of confidence; d. A great deal of confidence
11. A team of oil industry scientists recently reported the results of their research showing that because of new technology, offshore oil drilling is far safer than previously thought. How much confidence do you have in that claim? a. Almost no confidence at all; b. Only some confidence; c. A moderate amount of confidence; d. A great deal of confidence
12. A team of oil industry scientists recently reported the results of their research showing that because of new technology, offshore oil drilling is far riskier than previously thought. How much confidence do you have in that claim? a. Almost no confidence at all; b. Only some confidence; c. A moderate amount of confidence; d. A great deal of confidence
13. A team of environmental group scientists recently reported the results of their research showing that because of new technology, offshore oil drilling is far safer than previously thought. How much confidence do you have in that claim?

a. Almost no confidence at all; b. Only some confidence; c. A moderate amount of confidence; d. A great deal of confidence
14. A team of environmental group scientists recently reported the results of their research showing that because of new technology, offshore oil drilling is far riskier than previously thought. How much confidence do you have in that claim? a. Almost no confidence at all; b. Only some confidence; c. A moderate amount of confidence; d. A great deal of confidence

Impact Paragraph: a reflection on the scientific and societal impact of this dissertation

A personal perspective on this dissertation

As a person who grows up in a coastal city in China, the connection between the oceans and human society has always been fascinating me. When I was young, sitting on the beach and watching people surf on the waves, kids play with sand, tourists enjoy the sunshine, and fishermen drive their boats were a big part of my daily life routine. In my naive understanding, the marine environment is always beautiful and tranquil, and how humans make use of the oceans always stays in a harmonized and rational way. As time goes by, nevertheless, it becomes increasingly clear to me that how human utilize the oceans are not always harmonized and sustainable. Starting from 2008 summer, the coasts of my hometown city Qingdao suffered from the explosive growth of enteromorpha algae for several years. In the summer of 2011, a large-scale marine oil spill event, the Penglai-193 Oil Spill, occurred in my home province and caused huge impacts on the local economy and marine ecosystem. After that, The Fukushima Disaster happened in our neighbor country Japan and led to a panic spreading through almost the whole Chinese society concerning the polluted seawater reaching Chinese coasts. The panic atmosphere even triggered some salt-scrambling incidents in many Chinese cities. All the disasters give rise to a question in my mind: if current ocean use is not sustainable, how do people perceive their ways of using the oceans?

To me, this dissertation serves as my scientific endeavoring to answer the aforementioned question which has confused me for a long time. Especially at present, human society, regardless of whether in Global North or Global South countries, has been confronted with multiple sustainability challenges in the oceans, such as ocean acidification, marine resource depletion, marine biodiversity loss, and so on. How to co-exist with and sustainably use the oceans is vital to safeguarding the ocean environment and protecting ocean resources as well as critical to the living conditions of our future generations. Therefore, in this research, I, together with my research team at Maastricht University, want to explore how people in coastal Chinese society understand their uses of the oceans, including the use of marine life and offshore oil and gas drilling. By examining how coastal Chinese residents perceive their utilization of different marine resources, I intend to gain some insights into achieving sustainable use of the oceans. During this research journey, our research team has obtained abundant interesting outcomes regarding coastal Chinese attitudes' towards ocean use. These findings are not only insightful for the academic world to understand sustainable human use of the oceans under current global challenges of sustainability but also beneficial for various actors in societal and political domains to carry out decision-making and policy formulation.

Contribution and relevance to the scientific community

In this dissertation, we employed four chapters to describe how coastal Chinese perceive their uses of the oceans, including marine life and offshore oil and gas resources, and associate these public attitudes with different demographical and behavioral factors. We also delved into ancient Chinese society and traditional Chinese culture to look for the origins of such public attitudes. Findings from this research can contribute to the scientific community mainly through these four aspects. The first one is our research fills in the knowledge gap of how people perceive their uses of the oceans in contemporary Chinese society. For a long time, how individuals in Global South countries, especially emerging economies like China, recognize their utilization of ocean resources remain to be ambiguous. To the best of our knowledge, our research is the first study which ever investigated the public attitudes towards marine life and offshore oil and gas drilling in China in the academic world. With this research, comparisons from both horizontal (different nations) and vertical (different time periods) perspectives are facilitated. The second contribution is our research discovered several correlations between attitudes towards ocean use (marine life and offshore oil and gas) and social mental factors, including basic human demographics, moral ideology, and core environmental values. After telling a story of how coastal Chinese understand the uses of marine life and offshore oil and gas resources, this study further examined the influential variables of these attitudes, based on existing literature of animal and environmental studies. These predictors and correlations add value to the academic world by both enlightening future research directions on attitudes towards ocean use and testing if the associations discovered in earlier studies are also applicable to China. Another contribution lies in the unique roles of social and cultural contexts in understanding public perception of marine life and offshore oil and gas drilling in Chinese society. The present research uncovered that Chinese people's perceptions are deeply rooted in the thousands of years of agriculture-based ancient society and Confucianism-centered traditional culture. Without fully grasping the social contexts of Chinese society, it will be difficult to understand why coastal Chinese hold certain attitudes. The last contribution is our research can provide insights on how to achieve sustainable human use of the oceans, particularly under the background of increasing sustainability challenges all over the world. Human attitudes usually influence human behavior. A better understanding of human attitudes towards ocean use will help social scientists pinpoint the causes of unsustainable behavior and promote the discussion of sustainable human use of the oceans in the scientific community.

Contribution and relevance to the societal and political actors

Apart from scientific contributions and relevance, findings from this research also carry considerable moral and practical implications for societal and political actors to act in different policy domains. First and foremost, stakeholders involved in the arena of marine environment protection can find useful arguments in this dissertation. Our research results indicate that citizens in coastal Chinese society are largely aware of the significance of ocean conservation and "the greater good" may act as an ideal strategy to promote sustainable use of the oceans.

It is expected that raising public awareness will not be the focus of marine conservation efforts and the interests of the majority will be stressed in different ocean protection policies. Following that, some outcomes of this research can be constructive for decision making in marine fishing development and the fishery industry. This research observed coastal Chinese, in general, hold positive attitudes towards marine life protection but also feel relatively tolerable for consuming fishery products and using them in medical research. The development of the marine fishery industry in Chinese society is justified while still confronted with huge sustainability challenges ahead, such as the loss of marine biodiversity and fishery resource depletion. The key is to find the balance between human needs and marine fishery resource protection. On the one hand, policy making on fishery development is supposed to meet the increasing market needs in coastal Chinese society. On the other hand, policy formulation on fishery development should also facilitate and accelerate the transition to sustainable fishing in China. In addition, our research on public attitudes towards offshore oil and gas drilling is of great importance to the oil industry, oil and gas companies and organizations, and political actors related to offshore drilling in coastal Chinese society. Findings from our research have illustrated that coastal residents have low support, high risk-perception, and moderate trust in offshore oil and gas drilling in China. Although some of their perceptions on offshore drilling may not be valid or correct, political actors ought to take these perceptions into consideration when formulating offshore drilling policies. Questions like where to drill, how to operate, who can participate, and what are the risk responding plans should be addressed carefully.

Besides the direct links to decision-making in marine fishing and offshore oil and gas drilling, several indirect links can also be constructed from our research outcomes to policy making in the following three domains. Animal protection and animal welfare are the first indirect connection. For a long time, animal welfare and animal protection are not a firmly developed policy area in China. This is partly due to the reason that scarce knowledge is available regarding how individuals view their relationships with animals in contemporary Chinese society. Although not specifically pointing to animal welfare, our research outcomes still bring fair indications for political actors working in animal protection and animal welfare in coastal Chinese society. These results can help them not only better understand how Chinese people recognize animal protection, but also strategize their efforts in different policy advice on animal welfare. Coastal energy development is another area which subtly linked to our discoveries. Earlier studies have already illustrated the not-in-my-back-yard mentality show up in different coastal energy projects in China, including wind power, incineration power, and nuclear power. Findings from our research complete the missing link of oil and gas drilling in this public perception. Even though these results are offshore oil and gas related, they reflect the basic energy values of the public in coastal Chinese society. Furthermore, as we discovered the high-risk perception and moderate trust in drilling claims among individuals, various stakeholders, such as governments, the energy industry, environmental groups, etc. can extract useful information to themselves from these findings and work on corresponding countermeasures. Last but not least, our results also provide insights for decision making in the political arena of

marine spatial planning. Since we predicted some influential factors of public attitudes towards marine life and offshore oil and gas drilling, political actors engaged in marine spatial planning can take advantage of these results to decide on the sites for different purposes and design the layout of different coastal industries and manage, like fishing, drilling, tourism, etc. For instance, as coastal citizens feel relatively acceptable with using marine life in scientific research, the siting of marine research institutes can be closer to the residential areas.

Disseminating knowledge to create social impacts

During the past years, I have also actively participated in a series of academic activities, to draw attention to my Ph.D. project and research outcomes in the scientific community. Sometimes, as constrained by time and budget, I was not able to further increase the influence of my research findings or connect with other researchers. Especially, the Covid-19 pandemic swept the whole world since early 2020, which caused the cancellation of many scientific activities and limited the possibility of academic networking in the past three years. But I was fortunate enough to take part in several academic activities and network with some members in the scientific community. In the 2019 summer, I applied and get accepted by the 2019 European Summer School "Interspecies Relationality" (ESSIR) in Kassel, Germany. In 2020 spring I participated the Erasmus+ staff mobility program and did a short academic visit at Leuphana University of Lüneburg, Germany. In 2021 summer I joined the 2021 People & the Sea Conference (MARE 2021) virtually. In these academic activities, I presented my articles, received valuable feedback, built connections with researchers working on similar topics, and even discussed about potential collaborations in research projects in the future. In addition to the academic activities, dissemination to the scientific community has taken place through 3 journal publications (see publication list), the 4th is in preparation for submission. For future research and dissemination, I would like to encourage more research projects into human attitudes towards ocean use, especially different types of marine resources or different forms of marine pollution. And I also encourage more researchers, institutes, organizations, and stakeholders to attach importance to this research area. Only when we fully understand human attitudes towards their use of the oceans, can we deal with current sustainability challenges and achieve sustainable use of the oceans.

Summary

The oceans support the life of all the living creatures on land and the healthy functioning of the earth ecosystem. Nevertheless, current human use of the oceans is unsustainable globally. Not only human exploitation and utilization of marine resources stay at an unprecedented rate and in an irreversible way, but also human pollution and damage to the marine environment have reached a dangerous level and caused disastrous outcomes. Knowledge of human attitudes towards human use of the oceans is key to understanding unsustainable ocean use and achieving sustainable ocean use. Nevertheless, scarce information or knowledge, particularly regarding citizens from the Global South countries, is available in the scientific community. This research project was initiated under the background of global ocean sustainability challenges as well as the limited knowledge regarding the Global South in academia. In this research, we aim to explore how people understand the utilization of marine resources in contemporary Chinese society. In particular, this dissertation aims to gain insights into achieving sustainable human use of the oceans through investigating human attitudes towards utilizing marine resources in coastal Chinese society. By examining public attitudes towards marine life, offshore oil and gas drilling, and analyzing the origins of these public attitudes under the cultural and historical contexts in Chinese society, this dissertation engages in the debate of how sustainable ocean use can be achieved in coastal Chinese society. There are three questions are central to this dissertation:

i. How do people in coastal Chinese society understand marine life and marine life protection? And what are the influential factors that shaped such public attitudes?
ii. How do people in coastal Chinese society understand offshore oil and gas drilling? Especially, how much support do people show to offshore drilling? How much threats people perceive associated with offshore drilling? How much trust do people have in offshore drilling?
iii. What are the cultural and historical origins of Chinese attitudes towards marine life and offshore oil and gas drilling in coastal Chinese society?

In order to answer our research questions, an integrated assessment method was employed in this research. An online survey and a grounded-theory approach were utilized to collect data and ensure our analysis was conducted from multifaceted (social, cultural, historical, etc.) perspectives. The online survey was carried out between late September and the beginning of October 2018 in 22 mainland coastal cities in China: Dalian, Yingkou, Qinhuangdao, Tianjin, Yantai, Weihai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Xiamen, Shantou, Guangzhou, Shenzhen, Zhuhai, Zhanjiang, Beihai, Haikou, and Sanya. The questionnaire includes demographic questions, the Ethical Position Questionnaire (EPQ), the New Ecological Paradigm (NEP), a revised version of the Animal Attitude Scale (AAS), and a set of offshore drilling attitudes questions. Data analysis was performed with the help of SPSS

software program. The grounded-theory approach was based on results from our questionnaire and existing literature regarding the human-animal relationship in China.

This dissertation is composed of six chapters in total. Chapter 1 is the introductory section which draws the attention to our research topic, sustainable human use of the oceans. Starting from presenting the current unsustainable human use of the oceans, this chapter gives background information of this research, provides a review of literature, and describes the significance of researching sustainable human use of the oceans. More importantly, chapter 1 identifies the knowledge gap of human attitudes towards ocean use in contemporary Chinese society, states our research questions and objectives, and outlines the methodology of this research.

Answers to our research questions are provided from chapter 2 to chapter 5. Chapter 2 depicts a general picture of how coastal Chinese understand marine life and links this public perception to individuals' moral ideologies. By and large, coastal Chinese people hold positive attitudes towards marine life and marine life protection. Individuals are generally aware of the significance of marine life protection. Comparing to men, Chinese women are found to be more concerned about marine life using in coastal society. However, no age difference on attitudes towards marine life is detected throughout our dataset. A similar level of concern about marine life protection is observed among the elderly, the middle-aged and the youth in coastal China. The interaction between age and gender is found to be interrelated with marine life attitudes. For the several usages this research paid special attention (food, medical research, hunting/fishing, use of skin/fur, slaughter), using the skin or fur (from seals and sea otters, for example) is considered as the least tolerable but using marine life for food (i.e. fish, shrimps) or medical research is regarded as relatively more acceptable by citizens in coastal China. Moreover, how people understand the use of marine life is shaped by ethical ideology. Idealistic morality is positively correlated with attitudes towards marine life and relativistic morality correlates negatively. The more people believe in good actions will lead to good results, the more concerned they feel about marine life protection. The more people question the existence of universal moral standards, the less friendly they are towards marine life using. The absolutists, individuals who consider ethical behavior result in good consequences but also conform to universal moral principles, are the most friendly group to marine life among all four ethical positions (subjectivistis, situationists, and exceptionists). Moral ideology is also found to be correlated with all four usages particularly pointed out by the questionnaire except for use in medical research.

Chapter 3 investigates how citizens in coastal China perceive marine life from a different angle, the environmental concern. This chapter starts with researching individuals' core environmental values in coastal Chinese society, and then explores the correlation between attitudes towards marine life and one's core environmental values. As indicated in some earlier scientific studies, our results reveal that coastal citizens have a good awareness of environmental protection in China. On the one hand, people in coastal Chinese society mostly

endorse a pro-ecological worldview and feel concerned about environmental degradation. On the other hand, they are also relatively passive in participating in environmental conservation activities. Men, north China citizens, car owners, and people who believe religious beliefs important in life are found to be less concerned about environmental degradation than their equivalents (females, south China citizens, people who own no car, and people who deem religious beliefs not important in life). Five dimensions of the NEP scale (the reality of limits to growth, anti-anthropocentrism, the fragility of nature's balance, rejection of exemptionalism, and the possibility of an eco-crisis) are all positively interrelated with how people perceive marine life among coastal citizens in China. The more people endorse an eco-centric worldview, the more positive they are towards marine life protection. The more people believe in an anthropocentric worldview, the less friendly they are towards marine life. The "anti-anthropocentrism" dimension is discovered to be the most important in understanding marine life protection as it correlated with all four content categories targeted in this study (human moral dominance, food, hunting/fishing, medical research). In addition, public attitudes towards marine life are also uncovered to be associated with several environment-related behaviour, such as beach visits, NGO membership/donation, and transportation preferences.

Chapter 4 focuses on our second central research question by reporting findings regarding public attitudes towards offshore oil and gas drilling in coastal Chinese society. Judging by the outcomes of the online survey, public support to offshore oil and gas drilling remains at a low level in coastal Chinese society. This low-level support does not depend upon the location where offshore drilling is conducted. Expanding offshore oil and gas drilling on Chinese coasts also receives largely negative responses from our respondents. Nonetheless, it is worth noting that a NIMBY (not-in-my-back-yard) mentality exists in citizens' attitudes towards offshore oil and gas drilling in coastal China. Women and people who find religious beliefs are not important in life tend to be less pro-offshore oil and gas drilling than men and people who find them important. Gender, occupation, religious attitude, and dietary habits are uncovered to be predictors of offshore drilling support. Corresponding to the low-level support to offshore drilling, coastal citizens perceived a high risk associated with offshore oil and gas drilling in China. Although some of their risk perceptions may not fully match scientific evidence or the actual situations, the public is deeply concerned about the possibilities of large-scale oil spills and their associated impacts on the marine environment and human health of coastal residents. In terms of trust in scientific information regarding offshore drilling, people hold different levels of confidence on the basis of information sources and contents. It is discovered coastal citizens have more trust in claims from environmental groups than the oil industry, regardless of their contents. Also, coastal residents in China have more confidence in scientific statements that indicate offshore drilling is risky than safe, regardless of the information source.

Our third central research question is answered in chapter 5. Built on findings from the former three chapters and some existing literature, this chapter digs deeper into the context of Chinese society to look for the origins of Chinese attitudes towards marine life and offshore oil and gas drilling. From both historical and cultural aspects, this chapter explains why coastal

Chinese hold certain attitudes and the relative tolerance to consuming and medical use of marine life. Actually, how individuals view the use of marine life and offshore oil and gas drilling reflects three worldviews prevailing in Chinese society: anthropocentrism, collectivism, and pragmatism. Anthropocentrism, collectivism, and pragmatism are deeply rooted in the agriculture-based ancient Chinese society and Confucianism-centered traditional Chinese culture. From a historical outlook, the thousands of years' agrarian ancient Chinese society provided a solid foundation for breeding these three mentalities. The hardships in agriculture production during pre-industrial time and farming based social norms and beliefs fostered the anthropocentric, collectivistic, and pragmatic inclinations among ancient Chinese to increase productivity and withstand outside risks. From the perspective of culture, Confucianism-centered traditional Chinese culture has greatly promoted the prevailing of anthropocentrism, collectivism, and pragmatism in Chinese society. Confucianism is intrinsically a mundane philosophy in which anthropocentrism is part of its kernel. By stressing the values of families, communities, and nations, collectivism is also embedded within the central principles of Confucianism. Pragmatism is integrated into the Confucianism philosophies in the world, nature, and change. In addition to Confucianism, Taoism and Buddhism, two other cultures which has deeply influenced traditional Chinese culture, have contributed to the prevailing of a mentality of pragmatism through their core ideas in Chinese society.

Chapter 6 ends this dissertation with a summary of our main findings, a discussion of insights for sustainable human use of the oceans in China, and reflections on this doctorate research. In this chapter, we explained what we have found throughout the research projects, i.e. human attitudes towards marine life and offshore oil and gas drilling in coastal Chinese society. Based on these findings, we conclude that 1. Promoting sustainable ocean use has a solid social base in China; 2. For marine fishery resources, balancing human needs and marine life protection is significant in terms of the present sustainability challenges; 3. For marine energy resources, establishing correct understanding of offshore drilling is key. In the end, this chapter closes this dissertation by reflecting on the limitations of this research and suggesting future research directions in this area.

Samenvatting

De oceanen maken het leven van alle levende wezens op het land mogelijk en zorgen voor een gezond functioneren van de aarde als ecosysteem. Toch is de wijze waarop mensen gebruik maken van de zee niet duurzaam. Om dit verschijnsel te begrijpen en duurzaam gebruik van de zee te bevorderen, is kennis van de houding van mensen ten opzichte van dat gebruik cruciaal. In dit onderzoek willen we nagaan hoe mensen aankijken tegen het gebruik van hulpbronnen uit zee in de hedendaagse Chinese samenleving. In dit proefschrift staan drie vragen centraal:

i. Hoe beschouwen mensen in de Chinese kustgemeenschap het leven in zee en de bescherming daarvan? En wat zijn de invloedrijke factoren die deze opvattingen hebben gevormd?
ii. Hoe beschouwen de mensen in de Chinese kustgemeenschap offshore olie- en gasboringen? In het bijzonder: in hoeverre steunen ze offshore boren? In welke mate zien mensen bedreigingen in verband met offshore-boringen? Hoeveel vertrouwen hebben de mensen in offshore-boringen?
iii. Wat is de culturele en historische oorsprong van de houding van de Chinese kustgemeenschap tegenover het zeeleven en offshore olie- en gasboringen?

Om onze onderzoeksvragen te beantwoorden, werd in dit onderzoek een geïntegreerde onderzoeksmethode ingezet. Een online enquête en een grounded-theory benadering werden gebruikt om gegevens te verzamelen en zo te zorgen voor een meervoudig perspectief in onze analyse. De online enquête werd in de herfst van 2018 afgenomen onder 22 Chinese kuststeden, met behulp van een vragenlijst die bestond uit demografische vragen, de Ethical Position Questionnaire (EPQ), het New Ecological Paradigm (NEP), een herziene versie van de Animal Attitude Scale (AAS) en een reeks vragen over de houding ten opzichte van offshore boren. De gegevens werden geanalyseerd met behulp van het computerprogramma SPSS. Een grounded-theory benadering werd toegepast op de resultaten van onze vragenlijst en bestaande literatuur over de relatie tussen mens en dier in China.

Dit proefschrift bestaat in totaal uit zes hoofdstukken. Hoofdstuk 1 is het inleidende gedeelte waarin de aandacht wordt gevestigd op ons onderzoeksonderwerp, duurzaam menselijk gebruik van de oceanen. Dit hoofdstuk gaat uit van het huidige niet-duurzame menselijke gebruik van de oceanen, geeft achtergrondinformatie bij dit onderzoek, geeft een overzicht van literatuur en beschrijft het belang van onderzoek naar duurzaam menselijk gebruik van de oceanen. Belangrijker nog, in hoofdstuk 1 wordt het hiaat in onze kennis over de menselijke houding ten opzichte van oceaangebruik in de hedendaagse Chinese samenleving geïdentificeerd, worden onze onderzoeksvragen en -doelstellingen uiteengezet en wordt de methodologie van dit onderzoek geschetst.

De antwoorden op onze onderzoeksvragen worden gegeven in hoofdstuk 2 tot en met 5. Hoofdstuk 2 schetst een algemeen beeld van de opvattingen van Chinese kustbewoners over

zeeleven, en koppelt deze publieke perceptie aan individuele morele ideologieën. Over het algemeen staan de Chinese kustbewoners positief tegenover organismen in de zeeën en de bescherming ervan. De mensen zijn zich over het algemeen bewust van het belang van de bescherming van het zeeleven. Chinese vrouwen blijken zich in vergelijking met mannen meer zorgen te maken over het gebruik van het zeeleven door de kustgemeenschap. In onze dataset is echter tussen leeftijdscategorieën geen verschil in houding ten opzichte van het zeeleven vastgesteld. De houding tegenover het leven in zee blijkt samen te hangen met de wisselwerking van leeftijd en gender. Van de verschillende toepassingen waaraan in dit onderzoek speciale aandacht is besteed (voedsel, medisch onderzoek, jacht/visserij, gebruik van huid/bont, slacht), wordt het gebruik van huid of bont (van zeehonden en zeeotters, bijvoorbeeld) als het minst aanvaardbaar beschouwd. Het gebruik van zeeleven voor voedsel (d.w.z. vis, garnalen) of medisch onderzoek wordt echter door de burgers in China aan de kust relatief als meer aanvaardbaar beschouwd. Hoe mensen het gebruik van zeeleven opvatten, wordt bovendien bepaald door ethische waarden. Idealistische moraliteit is positief gecorreleerd met houding ten opzichte van zeeleven en relativistische moraliteit negatief. Morele ideologie blijkt ook gecorreleerd te zijn met alle vier toepassingen die met name in de vragenlijst worden genoemd, behalve gebruik voor medisch onderzoek.

In hoofdstuk 3 wordt onderzocht hoe burgers aan de Chinese kust het zeeleven zien vanuit een andere invalshoek, namelijk de aandacht voor het milieu. In navolging van enkele eerdere wetenschappelijke studies blijkt uit onze resultaten dat de kustburgers in China goed op de hoogte zijn van bescherming van het milieu. Enerzijds hebben de mensen in de Chinese kustgemeenschap voornamelijk een pro-ecologisch wereldbeeld en maken zij zich zorgen over de achteruitgang van het milieu. Anderzijds zijn zij relatief passief in hun deelname aan milieubeschermingsactiviteiten. Mannen, burgers van Noord-China, autobezitters en mensen voor wie religie een belangrijke rol speelt, blijken zich minder zorgen te maken over de achteruitgang van het milieu dan hun tegenhangers (vrouwen, burgers van Zuid-China, mensen die geen auto bezitten en mensen voor wie religieuze overtuigingen geen belangrijke rol spelen). Alle vijf dimensies van de NEP-schaal blijken positief gecorreleerd met de manier waarop Chinese-kustbewoners het zeeleven ervaren. Hoe sterker mensen een ecocentrisch wereldbeeld onderschrijven, des te positiever ze staan tegenover de bescherming van het leven in zee. Hoe meer mensen geloven in een antropocentrisch wereldbeeld, des te minder vriendelijk zij staan tegenover het mariene leven. De dimensie "anti-antropocentrisme" blijkt de belangrijkste te zijn om bescherming van het zeeleven te begrijpen, aangezien deze samenhangt met alle vier de inhoudscategorieën waarop dit onderzoek is gericht (menselijke morele dominantie, voedsel, jacht/visserij, medisch onderzoek).

Hoofdstuk 4 richt zich op onze tweede centrale onderzoeksvraag en brengt verslag uit van een studie naar de publieke opinie ten aanzien van offshore olie- en gasboringen in de Chinese kustgemeenschap. Afgaande op de resultaten van de online enquête blijft de publieke steun voor offshore olie- en gasboringen aan de Chinese kust laag. Deze geringe steun is niet afhankelijk van de locatie waar de boringen worden uitgevoerd. Niettemin moet worden

opgemerkt dat er een NIMBY-mentaliteit (not-in-my-back-yard) bestaat in de houding van de burgers tegenover offshore olie- en gasboringen in China. Vrouwen en mensen voor wie religieuze overtuigingen niet belangrijk zijn, zijn over het algemeen minder voor offshore olie- en gasboringen dan mannen en mensen voor wie religie wel belangrijk is. Gender, beroep, religieuze houding en voedingsgewoonten blijken voorspellers te zijn van steun voor offshore-boringen. In overeenstemming met hun geringe steun voor offshore-boringen relateerden de kustbewoners offshore-olie- en -gasboringen in China aan een hoog risico. Hoewel sommige van hun risicopercepties misschien niet volledig kloppen met wetenschappelijk bewijs of met de feitelijke situatie, maakt het publiek zich grote zorgen over de mogelijkheid van grootschalige olielekken en de daarmee verbonden gevolgen voor het zeemilieu en de volksgezondheid aan de kust. Wat het vertrouwen in wetenschappelijke informatie over offshore-boringen betreft, hebben verschillen mensen in vertrouwen op basis van de informatiebronnen en -inhoud. Kustbewoners blijken meer vertrouwen te hebben in beweringen van milieugroeperingen dan in die van de olie-industrie, ongeacht de inhoud ervan. Ook hebben kustbewoners in China meer vertrouwen in wetenschappelijke verklaringen die aangeven dat offshore boren riskant is dan in verklaringen dat die boringen veilig zijn, ongeacht de informatiebron.

Onze derde centrale onderzoeksvraag wordt beantwoord in hoofdstuk 5. Uitgaande van de bevindingen uit de vorige drie hoofdstukken en de bestaande literatuur wordt in dit hoofdstuk dieper ingegaan op de context van de Chinese samenleving om de historische en culturele oorsprong van de Chinese houding tegenover het leven in zee en offshore olie- en gasboringen te onderzoeken. De manier waarop individuen tegen het gebruik van het zeeleven en offshore olie- en gasboringen aankijken, weerspiegelt drie wereldbeelden die in de Chinese samenleving overheersen: antropocentrisme, collectivisme en pragmatisme. Historisch gezien heeft de duizenden jaren oude agrarische Chinese samenleving een sterke basis gelegd voor het voeden van deze drie denkbeelden. De ontberingen in de landbouwproductie tijdens de pre-industriële tijd en de in de boerengemeenschap gewortelde sociale normen en overtuigingen bevorderden de antropocentrische, collectivistische en pragmatische instelling van de oude Chinezen om de productiviteit te verhogen en risico's van buitenaf te weerstaan. Vanuit cultureel oogpunt heeft de confucianistische traditionele Chinese cultuur het antropocentrisme, collectivisme en pragmatisme in de Chinese samenleving sterk bevorderd. Het confucianisme is intrinsiek een mondaine filosofie waarin antropocentrisme, collectivisme en pragmatisme geïntegreerd zijn in de kijk op de wereld, de natuur en verandering. Naast het confucianisme hebben ook het taoïsme en het boeddhisme, twee andere culturen die de traditionele Chinese cultuur diepgaand hebben beïnvloed, via hun kernideeën bijgedragen aan de heersende mentaliteit van pragmatisme in de Chinese samenleving.

Hoofdstuk 6 besluit dit proefschrift met een samenvatting van onze belangrijkste bevindingen, een bespreking van inzichten voor duurzaam menselijk gebruik van de oceanen in China, en reflecties op dit promotieonderzoek. Op basis van deze bevindingen concluderen we 1. Het bevorderen van duurzaam oceaangebruik heeft in China een solide maatschappelijke basis; 2.

Voor bronnen voor zeevisserij is het balanceren van menselijke behoeften en de bescherming van het zeeleven belangrijk in het licht van hedendaagse uitdagingen rond duurzaamheid; 3. Voor energiebronnen in zee is het bevorderen van een correct begrip van offshore boren essentieel. Ten slotte beschouwt dit hoofdstuk de beperkingen van het onderzoek en doet suggesties voor toekomstige onderzoek op dit gebied.

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“You must be ready to burn yourself in your own flame; how could you rise anew if you have not first become ashes?”

-Friedrich Nietzsche “Thus Spoke Zarathustra”

List of Publications

1. Chen, M., & Martens, P. (2021). Coastal residents' attitudes toward offshore oil and gas drilling in China. *The Extractive Industries and Society, 8*(3), 100942. Doi: https://doi.org/10.1016/j.exis.2021.100942
2. Chen, M., & Martens, P. (2022). Ethical Ideology and Public Attitudes Towards Marine Life in China, *Society & Animals* (published online ahead of print 2022). Doi: https://doi.org/10.1163/15685306-bja10090
3. Chen, M., & Martens, P. (2022). Environmental Concern and Public Attitudes Toward Marine Life in Coastal China. *Anthrozoös*, 1-20. Doi: https://doi.org/10.1080/08927936.2022.2101247

About the Author

Mo Chen was born on February 23rd, 1989 in Chaohu, Anhui Province, China. In childhood, he moved with his family to Qingdao and grew up in this coastal city. He obtained a bachelor's degree in social work in 2011 and a master's degree in sociology in 2015. During his master's program at the Ocean University of China, he began to take an interest in the relationships between human society and oceans and structured the ambition of becoming a marine social scientist. Together with his master's program supervisor Prof. dr. Feng Cui, he has published (in Chinese) two articles in high-quality scientific journals and one chapter in the Blue Book of Ocean Society (2015). Besides, he has been awarded the National Scholarship for Postgraduates from the Chinese government in 2014 and the PhD Program Scholarship from China Scholarship Council (CSC) in 2015.

In March 2018, Mo Chen started his PhD project at Maastricht Sustainability Institute at Maastricht University, the Netherlands. Under the supervision of Prof. dr. Pim Martens and Prof. dr. Marc Davidson, he has conducted a series of research activities and applied both quantitative and qualitative methods in his project. Some of the research outcomes has been translated into scientific publications. Meanwhile, he has developed broader research interests, including planetary health, sustainability, human health and society, human-animal relationships, risk perception. In addition to doing research, Mo Chen has a passion for education. He has worked as a teaching assistant for both bachelor-level and master-level courses in the Faculty of Science and Engineering and the Faculty of Health, Medicine & Life Sciences. He has also supervised multiple master theses at Maastricht University.