Decrease in traditional ecological knowledge through *modernization*:
Perspectives on culturally protected village *fengshui* forests in Southeast China

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Appendix 4: Extra figures and quotes

Appendix 2: Position of villages in Wuyuan County, Jiangxi Province were interviews where performed

Appendix 3: Interview questions and criteria table (Used for converting qualitative data to quantitative data)

Appendix 4: Extra figures and quotes

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Abstract
China’s fast development after the founding of the People’s Republic in 1949 involved intense pressure on forests, leading to a massive decrease and degradation of forest landscapes, loss of biodiversity, soil erosion and flooding. However, many village *fengshui* forests (VFFs) have been spared devastation due to protection by informal village institutions built on *fengshui*, a form of traditional ecological knowledge (TEK).

This study aimed to find out what happens with TEK of VFFs as Chinese society goes through modernization by looking at the difference between younger and older generations in Wuyuan County in Southeast China regarding: (1) knowledge about, beliefs related to, and attitude towards the VFFs; and (2) values associated with ecosystem services (ES) provided by the VFFs. Ninety-four interviews with “young” and “old” villagers were carried out in 10 villages in the county. The results show that TEK of VFFs is weakening and that the older generation values ES provided by the VFFs significantly higher than younger generations.

As a complement, questions on historical changes in management and livelihoods from the VFFs where posed, revealing possible causes of the loss of TEK, such as suppression of belief systems and abandonment of ancient culture during the political campaigns of the 1960’s and 70’s in China. In conclusion, protection of VFFs will likely require recognition from higher authorities and inclusion in conservation policies. Further, the health and continued survival of the interlinked social-ecological system of VFFs will require acknowledging existing *fengshui* culture and involving local stewards in VFF management.

**Acronyms**

1 “Attitude” in this paper is explored in terms of “willingness to put the VFF over personal wealth” reflected in the first and second question of the Attitude Section in Appendix B.
Introduction

In only 30 years, China has developed from one of the poorest nations in the world to being the second largest economy globally today (Kram et al., 2012). This rapid transition has had, and continues to have, a massive negative impact on China’s
ecosystems due to land use change, unprecedented urbanisation and population increase (Deng, Huang, Rozelle, & Uchida, 2008; Kram et al., 2012). China’s deforestation increased after the founding of the People’s Republic of China (1949) and intensified after 1978 up until year 2000, when the country prioritised economic development over environment. This has led to decrease and degradation of forest landscapes (especially natural forest cover), loss of biodiversity, soil erosion, and flooding (Démurger, Yuanzhao, & Weiyong, 2007; Tian & Chao, 2010).

Village Fengshui Forests (VFF) – an introduction

Chinese village fengshui forests (VFF) are culturally protected forests (CPFs) located near villages in China that often, despite development, have been preserved by Chinese local communities due to beliefs in fengshui, in western literature often translated as a form of geomancy (Hu, Li, Liao, & Fan, 2011; Coggins et al., 2012; Yuan & Liu 2009). Culturally protected forests (CPFs) are common in many parts of the world and are small patches of forests that have been preserved, often for centuries, due to beliefs or taboos on the basis of traditional ecological knowledge (hereafter TEK) (Gao, Ouyang, Chen, & Koppen, 2013; Githitho 2003; Gould et al., 2014; Salick et al., 2007; Örjan Bodin, Maria Tengö, Anna Norman, Jacob Lundberg, 2006)

Since VFFs have been protected and managed on the principles of fengshui for so long, they often consist of late successional forests with high species diversity and habitat heterogeneity (Gao et al. 2013; Hu et al., 2011; Yuan & Liu 2009). System ecologists emphasize the importance of VFFs for maintaining regional biodiversity. Moreover, those “small remnant VFF patches are expected to improve regional landscape connectivity and increase local species and habitat diversity” (Hu et al., 2011).

Beliefs and knowledge of fengshui, here regarded as a form of TEK, is little understood and studied in the Western world even though it has an extensive impact

2 Geomancy is another word for fengshui. Fengshui originates from Chinese but the same or similar concepts are used in other East Asian countries. Therefore in Western scientific terms, the general word for teachings of fengshui is Geomancy. Geomancy teaches people to “not cause disorder in geomantic harmony of nature by indiscriminately modifying either natural or cultural landscapes”(Yoon, 2006).
on landscape and culture in China - “The use of land can hardly be understood apart from it” (Yoon, 2006).

In parallel to ecosystem degradation and through communities adaptation to a modernised lifestyle stirred by forces of globalization, industrialization and economic development, TEK is reported to be decreasing in many parts of the world (Pilgrim, Cullen, Smith, & Pretty, 2008; Turner & Turner, 2008; Pilgrim 2006). The ecological knowledge loss often occurs in the first stages of economic development, due to decrease in interactions with the natural environment because of engagement in external economies, and reduced intergenerational knowledge transfer (Pilgrim et al., 2008). Some research also shows how incentives to act environmentally and care for nature is linked to amount of ecological knowledge as well as emotional attachment to it (Pyle, 2003; Kollmuss & Agyeman, 2010).

Many researchers suggest that TEK could be a help in dealing with the issue of generalised ecosystem service decline and global change in the world (MA 2005) as well as contributing to improve health of social-ecological systems by complementing and relieving knowledge deficit in modern sciences on natural resource management and in policymaking (Becker & Ghimire, 2003; Berkes, Colding, & Folke, 2000; Editorial & Corbera, 2013; Oudenhoven, Mijatovic, & Eyzaguirre, 2010; Turner, Ignace, & Ignace, 2000). There is a lively discussion of how TEK could be understood and integrated into these areas (Gagnon & Berteaux, 2009; Huntington, 2014; Tengö, Brondizio, Elmqvist, Malmer, & Spierenburg, 2014; Usher, 2000).

TEK studied in China has mostly focused on positive correlations between indigenous/ethnic minority groups, TEK, and biodiversity conservation (Hongmao, Zaifu, Youkai, & Jinxiu, 2002; Jiao et al., 2011; Lee & Schaaf, 2003; Shen et al., 2012). In contrast to TEK of indigenous and minority groups in China, fengshui is a general concept that mostly has been developed and used by the Han Chinese people, the largest and dominant population group in China.

Village fengshui forests have been studied from historical and anthropological perspectives (Coggins et al., 2012; Yuan & Liu, 2009) as a natural and cultural heritage (Marafa, 2010), and in terms of their ecological and biodiversity dimensions (Gao et al., 2013; Hu et al., 2011), but the relationship between villagers’ culture and
fengshui forests remain poorly understood and no research has looked at the commons attitude and knowledge regarding the fengshui forest. Earlier research assessing TEK of fengshui has mostly deployed semi-structured interviews with experts, such as fengshui-masters and scholars. This is effective for explaining the concept and details of fengshui, but not a good tool if you want to assess existing culture among ordinary people.

Situation of VFFs in China

A large part of the VVFs in China remain unrecognized by higher authorities and are only protected collectively by village culture, customs and informal rules (Coggins C et al., 2009, H.Yu, personal communication, January 10, 2015, P.Zheng, personal Communication September 2, 2014). Villages in China are locally ruled by village cadres authorised by the Chinese state but with representatives elected directly by the villagers themselves (Constitution of the People’s Republic of China, § 97 1982; Chen, 2015).

The Chinese state or collectives owns all land in China. Land owned by the state is leased to the rural population. However the state has the statutory right to expropriate both collectively owned land and state owned land if there is a desire to develop a place for “the public interests” (with compensation) (Property Law of PRC §§10 & 42, 2007). It is not defined in the law what the “public interests” comprises, therefor it is easy for local officials in the village cadres to use this clausal in order to make money and sell property to state developers and it is hard for villagers that don’t agree to the selling to object the “land-collection” due to this fussiness in the law (Kram et al., 2012). From year 1999-2002 66,3 million farmers are reported to have lost their land due to land expropriation for resale and development purpose in China (Li, 2008).

This means that if TEK along with informal local institutions (Folk Regulation and customs) reflected in the village cadres decisions, weakens, the VFFs future existence is in danger; especially in places where the community is poor and can make fast income from selling out the land.

Study site
To assess what happens with informal institutions and TEK of VFFs when China modernises, a series of interviews with villagers in Jiangxi province, Wuyuan County in Southeast China where performed.

Wuyuan County was chosen as a study site due to that it is a typical example of a region that has undergone a fast development towards a modern society over the course of just a few years and because almost every village in the areas is connected to one or several VFFs (commonly 20-30 hectare in size) (H.Yu, personal communication, January 10, 2015; P. Zheng, personal communication September 8, 2014).

According to H.Yu (personal communication, January 10, 2015) at Wuyuan County Forestry Bureau, VVFs in Wuyuan are important both because they have a high forest biodiversity and contain several rare tree species and plants that cannot be found outside of Wuyuan, and because most of them consists of old grown forest which is rare in Wuyuan after the past decades of deforestation and afforestation of production forest.³

The rapid development in Wuyuan is driven by from the Chinese government and private companies in the tourism industry of the area. As a result, the yearly number of visitors to the County has increased from 125 000 in year 2000 to 12,7 million in 2014 (Huang X., personal communication June 10, 2015). With a newly built highway, connecting Wuyuan to Beijing and a fast speed train that opened in June this year (2015), the

³ About half of the VFFs in Wuyuan are included in so called “Public Forests” (Gongyilin 公益林), which are protected by the state and about half of them remain unrecognized by higher authorities and only protected collectively by village customs and informal rules (Coggins C et al., 2009, H.Yu, personal communication, January 10, 2015).

⁴ Information provided by Huang X. comes from Wuyuan Tourism Bureau.
number of visitors to Wuyuan are expected to increase even further in the near future. This, in combination with urbanization in form of young people moving out of the villages to work in urban centres are expected to change lifestyle and attitudes regarding the landscape and the VFFs, especially among the younger generation.

Urbanisation trends expected to affect TEK and attitudes regarding VFFs

The movement of younger people migrating out of the County and into urban areas seen in Wuyuan, is a common trend in most rural areas in China and can be linked to changes on a larger scale in the whole Chinese society. China has had unprecedented urban migration after the initiation of economic reforms in 1978 and enhanced after Chinas entry in the WTO in 2001 (Zhang & Song, 2003).

The reason for the rural population to move into urban areas is a combination of attracting and pushing forces. The former being higher living standards, better chances to economically support the family at home and the variety of entertainment and career chances (Hu, 2012). The later being primarily the one-child policy introduced in the end of the 70s leading to a steadily aging population and a heavy family burden for Chinas youth that have to support the whole family alone, which in combination with a privatization of the public sector, with rising medical fees and schooling costs are forcing young people to make more money in order to support themselves and the family (Blumenthal & Hsiao, 2005).

Recent studies show that many young people, likely due to lifestyle changes related to urbanisation and modernisation, have changed worldview radically and moved from a collective to a more individualistic approach regarding goals and life-purposes (Liu & Wang, 2009).

Based on this shift, it is of interest to see if this have had and effect on how the younger generation in the rural communities value and understand the nearby landscape, reflected in the attitude and TEK regarding the VFFs.

Aim of the study

This study contributes to the body of literature on changes/loss of TEK in the world and filling a gap on this topic in China by assessing what happens with local informal institutions and TEK of VFFs among common villagers when modernisation,
urbanization and globalization enter the Chinese countryside. The aim is to find out whether TEK is weakening and/or transforming into something new.

Changes in TEK where assessed by asking a subset of questions in different categories on important aspects of VFFs in developed and less developed villages in Wuyuan. Two age groups: “Old” and “Young” where interviewed regarding: 1) Attitude toward 2) Knowledge about 3) Beliefs in 4) Livelihood from and values attached to ecosystem services of the VFFs.

Theoretical and conceptual framework

Fengshui seen as a Social-Ecological System

The basic principles of fengshui teach people to “not cause disorder in geomantic harmony of nature by indiscriminately modifying either natural or cultural landscapes” (Yoon, 2006). The institutions and the culture of fengshui that have sustained the VFFs are examples of closely linked social-ecological system (SES). In this study, the village and forests are treated as one unit rather than two separate parts. Social Ecological Systems (SES)-concept emphasizes people as part of nature (Berkes, Colding, & Folke, 2002) and the co-evolution of social and ecological systems (Folke, Colding & Berkes, 2003).

Fengshui, a form of traditional ecological knowledge (TEK)

The knowledge, attitude and beliefs of VFF based on fengshui is in this thesis regarded as a form of TEK, classified as “a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment.” (Berkes, Colding & Folke 2000, p.1252). The study is inspired by earlier research showing positive correlation between biodiversity and fengshui practices in China (Gao et al., 2013; Hu et al., 2011, Liao et al., 2008, Coggins et al., 2012, Marafa 2010, Yuan & Liu 2009)

Similarities between fengshui and the ecosystem services (ES) framework
Just as the Millennium Ecosystem Assessment (MA) framework is a tool to analyze SES which can be used as a policy instrument to improve ecosystems and human well-being (MA 2005), *fengshui* is a framework used as a tool for understanding how humans best can benefit from and work in harmony with complex SES without interfering with the different interactions and flows in the system. Therefore, *fengshui* is in this thesis treated as a culturally specific conceptual ideation of ES concepts. "Ecosystem services are the benefits people obtain from ecosystems" (MA 2005, Preface), including provisioning services (e.g. food and water) regulating services (e.g. flood and disease control), cultural services (e.g. spiritual and recreational) and supporting services, (e.g. nutrient cycling) (MA 2005).

*Basic concepts of fengshui – the role of village fengshui forests in the “fengshui-landscape”*

_Fengshui_, (风水), literally translates as wind and water, and its practices go back more than 4000 years and have developed with many layers of interpretations and influences from above all Daoism, but also Confucianism and some elements of Buddhism. (Teather & Chow, 2000). *Fengshui* is often described as "*The Chinese art of placement*", with particular focus on how human settlements and graveyards are affected by the natural surroundings (Brunn 1995). However, due to that *fengshui* is a flexible and adaptive system it is applied in many settings and on different scales. In the western world *fengshui* has been interpreted (often simplified) and promoted in the area of interior design (Hwangbo, 1999).

Key concepts described in Table 1 are basic concepts of *fengshui* attained firstly by semi-structures interviews with villagers in Wuyuan County and then discussed with a local *fengshui* expert (W. Jiang, personal communication November 14, 2014). These concepts are in Wuyuan considered on both small and big scale, on a landscape level and on the interior of the houses.

**Table 1. Basic concepts of fengshui and how they relate to the VFF:**

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Note: The above text is a natural language representation of the content in the provided image and raw text, formatted for readability and coherence. The table mentioned in the text is not included in the image provided.
Fengshui is built on the notion of qi, a cosmic vital force that imbues in everything, and that flows through the landscape in similar ways as waterways. Some qi has a positive influence on people while some is malignant. In simple terms malignant qi is qi that is either too strong or too weak. According to fengshui principles humans, cosmos and the earth has different qi and the purpose of fengshui is for humans to live in harmony with and receive positive influences from the qi of the earth and the qi of the universe.

Meridians of the Dragon (龙脉)

Looking from above, a mountain range can be seen as a shape of a curling Chinese dragon. Places in the landscape where qi and water flows are interpreted as veins of a dragon, Longmai (龙脉). Human settlements are supposed to make use of natural flows and not interfere with them.

Village fengshui forest (VFFs)

The VFFs are situated around the village and are supposed to protect against malignant qi, winds and erosion, as well as to influence and represent the abundance, health and wealth of the village population. The abundance of the trees on the hills and by the waterways is reflecting the qi flowing through the “meridians” in the landscape. Traditionally (and sometimes still) the VFFs in Wuyuan where protected through “kill pig- protect mountain tradition”, which implies that if someone gets caught cutting trees in the VFF, their family’s pig will be killed and shared among the other villagers as a public punishment.

Back Dragon Mountain (后龙山) & Watergate Forest (水口林)

VFFs have different names depending on their place in relation to the village. Most important, according to fengshui, is for a village to have a forest situated on the back hill behind the village, the “Back Dragon Mountain” and in front of the village by the water, the “Water Gate Forest”. The water gate forest has the function of protecting from qi to diffuse out of the village, as well as, just like the Back Dragon Mountain, protect the village in general (often from winds from the north). The Back Dragon mountain should ideally be u-shaped with forest covered mountains on the sides of the village as well, like a chair for the village to comfortably and against. The places of the village in relationship to forests, water and mountain all depend on the geography of the surrounding landscapes.

“The Camphor tree Master” (樟树老爷)

According to villagers in Wuyuan the Camphor in itself repels “malignant qi”. The Camphor tree has a special place in this culture and is said to be a spirit or be inhabited by a spirit called the Camphor tree Master that protects children from threats and sickness. The Water Gate forests often consist of Camphor trees. These supposed to have the function of protecting from qi to diffuse out of the village.
Figure 2: A “Back Dragon Mountain forest” (VFF) surrounding the village of Shicheng (石城) in Wuyuan County (notice the old grown broadleaved forest in contrast to planted forest on the hills).

Figure 3: A “Water Gate Forrest” (VFF) outside of Zhankeng (占坑) village in Wuyuan County. The WGF often consists of Camphor trees and has, according to fengshui, the function of protecting against malignant qi, protecting kids from bad luck and disease as well as representing the abundance, wealth and health of the population in the village. Close by big Camphor trees, villagers have often put a small shrine where they can go and burn incense and pray the Camphor tree master. It is also common to stick written prayers onto the Camphor tree (see cover photo).
Interview example of what *fengshui* is according to a 61-year old villager in Wuyuan:

“*Fengshui* is the same as the home of the people, it has a relationship to the environment. The earth has a certain qi and humans have a certain qi. If earth and human qi cooperate, it is called positive (right) qi. Under such conditions the place can develop, for example our home Wuyuan.”

Wuyuan *fengshui* expert, W. Jiang, (personal communication November 14, 2014) explaining essential concepts of *fengshui*:

“Qi is essential for us, that is what humans need, we incessantly breath throughout our life. The qi in the earth, in the Veins of the Dragon, is born in contact with the rotating sun. The qi that is created between the earth in the Dragon Veins and the sun is what keeps us alive. There is an old saying that goes: People are born from the earth, grow from the earth and will return to the earth again when they die. All we eat comes from the earth, therefore we put emphasise on the earth (in fengshui)...You can notice vitality of qi in the landscape, by looking at the trees growing by the Veins of the Dragon. In some places trees grow, but they don’t become abundant, but in some places the trees are really abundant, that’s because they receive a lot of earth qi from the Dragon veins”

**The Multiple Evidence Base Approach (MEB)**

A combination of multiple knowledge systems has been proven to be effective when managing natural resources (Tengö et al., 2014). In a society where transition from a very traditional to a modern lifestyle is happening at a fast rate, it is valuable to discuss how old knowledge systems on natural resource management could be included into modern management and policies on natural resources. The Multi Evidence Base (MEB) approach, used in ecosystem governance, is providing a tool for “how diverse knowledge systems can contribute to generate an enriched picture of a selected problem” (Tengö et al., 2014) will be used to discuss the result of the study.
Methods

To answer the research questions a mix of quantitative and qualitative approaches were taken. The qualitative data were used to complement the quantitative results.

Site selection

Four “developed” villages with high income from the tourism industry and less reliance on product from the nearby landscape and six “less developed” villages, with no income from the tourism industry and high reliance on product from the nearby landscape, were selected for the study. The villages all had a history of more than 300 years and were similar in landscape type. All villages had one or several VFFs. The selection was done through guidance from key informants (P. Zheng, personal Communication September 2, 2014, H. Yu, personal communication, January 10, 2015) and through short interviews in every village, roughly assessing the percentage of income from tourism industry per household, the main source of income, and the percentage of consumed food from the nearby landscape per household.

Developing interview questions (pre-study)

Interview questions where developed in a pre-study by first attaining information from local informants through semi-structured interviews and informal conversations on VFFs, local customs and VFF-management principles with ordinary villagers as well as with a local fengshui expert in Wuyuan (W. Jiang, personal communication November 14, 2014). These questions where then tested in one “developed” and two “less developed” villages and modified during this process (see interview questions in Appendix 3).

Criteria for interviewees

In total, 94 interviews where performed: half in developed villages and half in less developed villages; half in the age-group 18-36 (46 interviews) and half in age-group 55-99 (48 interviews) ; half with women (43 interviews) and half with men (50
interviews). The interviewees had all grown up in the villages, and the young interviewees had all lived a minimum of 16 years in the village where they were interviewed. The interviews where performed individually through random sampling technique.

**Structure of interview questions**

Changes in TEK of the VFFs were assessed, inspired by a interview methodology in P. Huntington (2000), using a strict questionnaire so that answers could be quantified afterwards, but with some open-ended questions giving the interviewee space for associations and reflections beyond subjects anticipated in the questions.

Open-ended questions explored:

1) **Knowledge about VFFs**, including location and function of the VFFs, difference between VFFs and other forest, important species in the VFFs, how the VFFs relates to *fengshui* and understanding and use of *fengshui* in the daily life.  

2) **Attitude toward VFFs**, including question elaborating on the willingness to put the VFF over personal wealth.

Closed-ended questions explored:

1) **Beliefs in VFFs**, including questions on longevity and wealth related to VFF, and whether or not VFFs are protecting against “malignant *qi*”

2) **Livelihood from the VFFs**, including questions on weather the villagers picked wild fruits, herbs and/or mushrooms from the VFFs and if they used to get more livelihoods from the VFFs 20 years ago

3) **Ecosystem service-valuation of the VFFs**, including provisioning, supporting, regulating and cultural services.

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6 The understanding and use of *fengshui* in daily life doesn’t strictly relate to the VFFs so two statistical test where run, one including and one excluding these. Both showed similar results.

7 “Attitude” in this paper is regarded as “the willingness to put the VFF over personal wealth” reflected in the first and second question of the Attitude-section in Appendix 3.
Extra (open-ended question): Historical key aspects on management of the VFFs for the past 100 years were included in the interviews among the villagers as well as with key informants.

The questions on ES were not intended as a full ES assessment, but rather a tool to bring out the knowledge villagers had on different ES. It was a useful concept that helped interviewees who, for different reasons, had difficulties in answering open-ended questions, such as people with less confidence or with less experience in expressing their thoughts.

The interviews were performed by the researcher alone, but with backing throughout the whole interview period, from a local assistant.

Data collection and analysis

Interviews were recorded on audiotape and transcribed in Chinese (Mandarin) by an assistant and later analyzed and converted from qualitative data to quantitative data using a special criteria table (see Appendix 3).

The criteria-table was developed parallel to developing interview-questions. The evaluation of “TEK-depth” was determined based upon key concepts of VFFs identified from frequent answers in the semi-structured interviews on VFFs in the pre-study. The rating was therefor based upon what “ordinary” villager’s brought up in the conversations rather than on expert knowledge.

The answers in the “knowledge category” where rated on a four-grade scale (“No knowledge (0)”, “Scarcce knowledge (1)”, “Some knowledge (2) and “In-depth knowledge (3)”). The answers in the categories “Attitude”, “Beliefs” and “ES-validation” where rated on a five-grade scale, since these questions also included a negative option (i.e. “not important” or “I don’t care”). The answers on “Livelihood” and “Historical key aspects on management” where only analyzed qualitatively and therefor not quantitatively rated.

At first, a finer scale where used when analyzing the data. Different scales on different categories of questions where also used (for example an extra 0,5 points where given to people that explained the ES-service). These where later adjusted for to make the result more easy to interpret and for the rating scale to be evenly distributed. The p-value was similar in all tests before and after this adjustment.
The quantitative data were later analyzed by using chi-squared test to find out the variance between 1) Age groups 2) Developed and less developed villages and 3) Genders.

Typical quotes from interviews that confirmed, complemented or in some way gave in depth to the quantitative results were included in the result section.

**Results**

Results are presented in the order of the categories of interview-question presented in
the Method-section (Interview questions and their rating is found in Appendix 3). All of the results in the categories of “Knowledge” and “Attitude and Beliefs” are in combination reflecting the overall status of TEK of VFFs among the villagers in Wuyuan. Results on the values associated with ES, in combination with responses from the “Attitude and Beliefs” section show how villagers validate the VFFs. Results on historical changes in Livelihood from and Management of the VFFs contribute to perspectives on why we see changes in TEK today.

**Overall result**

There were significant differences between the older and younger generation in the three categories: Knowledge (K), Attitude (A) and Beliefs (B). The elders showed to have more in-depth knowledge about VFF, stronger beliefs connected to the VFFs and stronger Attitude, i.e. willingness to put the VFF over personal wealth. The elders did also attach higher value to the ES provided by the VFFs, significantly higher than did younger generations.

In general, elders gave longer and more explanatory answers while the younger generations more frequently answered that they didn’t know and more often started sentences with “perhaps” or “maybe”, indicating a more in depth TEK among the older generation compared to the younger generation.

There were no significant differences between less developed and developed villages in any of the categories K, A, B or ES.

Many women showed less confidence in their own knowledge and the ability to express themselves in an interview setting. They often started the interview explaining that they never had been to school, asserting that they probably didn’t have anything to bring to the conversation. However, after the interview started and they got an understanding for the questions they often showed more confidence. Regardless of lack of confidence they showed similar results as men in all the categories K, A, B and ES.

Hereafter, only significant differences, i.e. the differences between generations will be presented in details below.

*Knowledge about VFFs (See figure 3&4)*
Among the older generations, 48% of the interviewees showed to have in-depth knowledge of the VFF compared to 23% of the younger generation. In specific, this is reflected for example in that 46 out of 48 of the older generation knew where the both the “Water Gate Forest” and the “Back Dragon Mountain” (VFFs) where situated compared to only 26 out of 46 of the younger generation (most young people knew one but not the other). 50% of the elders could explain functions of the VFFs in depth, compared to 28% of the younger generation. 40,5% of the younger generation didn’t think there was any difference between VFFs and other forest, compared to 12% of the older generation.

**Figure 3: Differences in knowledge regarding VFF between older and younger generations** (Combining all answers in the “Knowledge” category, Q1-Q7 in Appendix 3)

![Bar chart showing differences in knowledge between older and younger generations](chart.png)

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X^{2} = 53.941, \ df = 3, \ p\text{-value} = 1.155\times10^{-11}
\]

**Interview-examples on if and why young verses old people thinks there is a difference between VFFs and other forest:**

60 years old man (comment 2):
"The original (virgin) forests, the fengshui forests, are like parents and the artificial forest (the human-planted production forest) are like children. The old trees have much more experience, just like old people. But the old tree is still young actually, it shoots branches whenever it gets water, and new trees grow out from it. The old trees can accumulate more pollution. If the small children, the young forest get exposed to too much pollution they will die, but the old trees will still have the ability of survive and shoot new branches. The old trees are taller so they look after the small children-trees, and absorbs most of the pollutants so that the children can survive."

29 years old woman (comment 2):

Aren’t all of them forest? I’m not so sure, because I seldom go up there (to the forest).

Interview-examples showing what functions/benefits old verses young villagers thinks the VFFs has for them:

88 years old man (comment 3):

“The VFF is protecting the village and working as a wind-break. It is good for fengshui. The more trees the more abundant the population will be.”

62 years old man (comment 4):

“The veins of the Dragon is nourishing us, the population in this village! If there is no Dragon Veins it doesn’t work! If they where not there, the population here would not be as many. They are very important. People will prosper and gain success because of the Dragon Veins! It has a development-function (good for this villages development).”

25 years old boy (comment 5):

"Off course it has benefits for us, for example is cleaning the air from all CO2 discharge that the tourism brings here. It also has noise-reduction function, and for thermoregulations; it will never be too cold or too warm here, and it's an attraction for the tourist."

Knowledge and practices of fengshui (indirectly related to VFFs) (see figure 4)

Among the older generation, 42% both practiced and had in depth knowledge about fengshui in general compared to 11% of the younger generation. There was a
significant difference between both knowledge and practices in *fengshui* between the younger and older generation.

**Figure 4**: Differences in *fengshui* knowledge and practices between the older and younger generation (Q23 & Q24 in Appendix 3)

![Graph showing differences in knowledge and practices between older and younger generation](image)

**Attitude toward VFFs** (see figure 5)

The older interviewees showed more willingness to put the VFFs above personal things of value compared to the younger generation. On the question: "If this forest was cut down to develop this village further and you would gain from it economically, what would you think of it?" 71% of the older generation said (with certainty) that they would oppose to that compared to 41% of the younger generation and only 8% of the older generation said they didn’t care (or were happy to see the forest cut down if they could gain from it economically), compared to 15% of the younger generations.

There were no significant difference between older and younger generations when comparing the answers in the second question in the Attitude category, "If you consider the loss of this forest being removed, compared to if you would lose something of value to you in your home, which one is most important". However on this question 24% of the young people answered (with certainty) that they would put personal things of value over the forest, compared to 8% of the older generations.
Many interviewees expressed that it was hard for them to compare community property with personal valuables. Therefore, the first Attitude-question, in combination with the ES-results (see below) likely better reflect the value of the VFF to the villagers.

**Figure 5: Differences in Attitude towards the VFFs between the older and younger generation** (Q14 in Appendix 3)

![Differences in Attitude towards the VFFs between the older and younger generation](image)

X-squared = 8.358, df = 4, p-value = 0.07931

The difference between the two groups shows a statistical trend toward significance (p-value: 0.079). The difference between the two groups where more evident when looking at the qualitative answers. Results not captured in the statistical analyses are shown in quotes below.

**Interview-examples showing the change in Attitude between the older and younger generation:**

84-year old man (comment 6):

"Some care, some don’t. People that care more for money are making up a bigger proportion nowadays. To some extent, the elders have a traditional thinking, but they are quite few. Nowadays the young people don’t trust these set of thoughts, they will prefer money (over the VFF); the elders don’t want money."

60-year old man (comment 7):
“You asked the questions before about personal benefits. I believe it is much more important to consider this from the whole community’s point of view. You have to consider everyone here. This forest abundance is more important than the abundance of anything else, as soon as the pollution comes in it will protect the whole village. To protect the forest is to protect your health. It doesn’t only clean pollution; you can also see that people from Wuyuan are healthier (than in other places). The young people know a little bit about this if they have been to school, but they don’t know the things that we, the older generation have learned through experience, year after year. Like, for example, if you cut the tree, what happens to the surroundings, why is there no water all of a sudden...This kind of knowledge is also kind of science, that has developed through experience, just like other knowledge (science), through experiments, before we even knew what science was. It has taken a long time to develop.”

28 years old man (comment 8):

“People today are realists, to me things have to have a value. If they say to me they can afford it (the VFFs), then I will make a deal with them (laugh). We don’t use the forest a lot; we just cut a little firewood once a year. My own valuables are more important than the forest.”

Many old people had a hard time understanding the concept of individual benefits in the ES section and in the Attitude section, and often answered questions from the whole community’s point of view rather than individually, while the younger generation had no problem in understanding the interview questions that were more I-centred.

**Interview-examples showing how different generations consider the VFFs from a community perspective verses an individualistic perspective:**

84-years old man (comment 9):

“One man cannot decide over (seize) the forest, but the home belongs to the individual. If you ask me, I will prioritize not destroying the forest (over personal economic benefits), because you should consider the culture of the village. If the household gains more money it will only benefit the individual, not the community.”
68-years old woman (comment 10):

“The water gate forest protects the community’s safety, if someone cuts that I would of course protest, if it gets cut it risks everyone’s security.”

81-year old man (comment 11):

“From a long time perspective the forest is more important, from a short time perspective the personal belongings are more important. I see things from a long time perspective!”

36-year old woman (comment 12):

”Personal wealth is important, and the forest is important as well. According to me, my personal valuables are certainly more important; I don’t need to be hypocritical about that.”

Beliefs related to VFFs (see figure 4A & 4B)

There was a significant difference between the older and younger generations regarding their beliefs related to the VFFs. Among the older generations 73% said they believed that the VFFs influences the villagers longevity compared to 37% of the younger generations and 58.5% of the old people compared to 19.5% of the young people said they believe that the VFFs influence the villagers’ wealth (success). Moreover, 71% of the old interviewees said they believed that the VFFs protects against malignant “qi” compared to 37% of the younger interviewees.

Figure 6: Differences in “spirituality & beliefs” between the older and younger generation (Combining Q13, Q17, Q18 in Appendix 3)
Figure 7: Difference in how old and young valuates the importance of protection against malignant qi (“Spirituality and beliefs”)

X-squared = 53.137, df = 4, p-value = 7.978e-11

X-squared = 15.864, df = 4, p-value = 0.003207

Strong beliefs in VFFs in combination with Strong Attitude:
52% of the elders (25 out of 48) both showed strong beliefs in spiritual values of the forest, including questions regarding longevity, wealth and protection against malignant “qi” and strong willingness to put the forest in above personal things of value (A) while this number in the younger generation was only 13% (6 out of 46) (no correlation).

**Interview-examples showing how spiritual elements and beliefs connect to Attitude regarding VFFs:**

86-year old man (comment 13):

“We elderly will not accept if some one wants to cut the VFFs. Fengshui is the human bones buried in the earth. The Veins of the Dragon is like that Dragon you see (are celebrated) in the mid Autumn Festival in August (Chinese lunar calendar). The Dragon will protect the village. Before, the Head of the village said that if you destroy the Veins of the Dragon, there would be no water. After that, we started to protect those (the veins) and things became better. This year I spent a lot of money on paper lanterns (for the Dragon).”

32 years old man (comment 14):

“Longevity has to do with people’s nutrition (food intake). That people would grow older due to that there are plenty of forest lacks scientific foundation….I would not protest if they wanted to cut the fengshui forest, if the forest can give us wealth.

“People die for money, birds die for grains”. When developing tourism villages will still grow new trees. If they cut the trees here, you can still plant new trees in other places.”

82-year old man (comment 15):

“When the entering dragon (Lailong 来龙) is raising (the veins coming down to the village) and the trees by the Watergate are standing up, the qi of the earth will be better. An old saying over here is that when the old trees fall down, the old people will die...No, no, no, you cannot cut down the VFFs, I would protest. If they are cut down we will be in despair. Even if they gave me a lot of money I wouldn’t want them. If they are cut, it will be bad for people that live here. If the forest on the mountains would be gone, there will be no home for us.”
Livelihood from the VFFs

Out of all villagers, 75.5% said they used to get more livelihoods from the VFFs 20 years ago compared to today. There was no significant difference in livelihood from the VFFs between less developed and developed villages today. Out of all interviews 9.5% considered livelihood from the VFFs very important, 45.5% as important, 13% as a little important, and 30% as not important (2% didn’t know).

Interview-examples showing changes in livelihood from the VFFs over the past 20 years:

62-years old man (comment 16):

“Now life is much better, you don't need to go and pick that stuff! We will go to the pharmacy to buy medicines now, but sometimes when we have a cold we still pick some herbs, like this one (he points on a herb hanging in the roof to dry). It smells very good!”

27 Years old man (comment 17):

“Before it was much more, nowadays people don’t want to pick, so its natural that young people today don’t know those things. Nowadays people trust western medicine, not recipes (folk prescriptions) that where handed down from older generations…”

60-years old man (comment 18):

“Before we picked herbs and sold to the pharmacies. The young people don't know much about herbs any more because they are busy with tourism.”

81-years old woman (comment 19):

“Nowadays I don't pick herbs anymore, but before I did. When I had any kind of disease, I went to pick different herbs to cure that kind of illness. About 20 years ago I still picked herbs. I can still recognize them, but nowadays I only see the big ones because my eyes are bad, the small ones I can't see anymore. But herbs are still very
useful, some illnesses cannot be cured with modern medicine, then they take some herbs and get cured, so it is still important!”

Ecosystem services (ES) (See figure 8 & 9)

Most of the ES associated with the VFF (73.5%) where regarded as important or very important by the villagers and many of the interviewees, especially the older generations also described why the different services where important.

A significant difference was observed between the younger and older generation regarding the importance of different ES. The older generation regarded 26.5% of the ES to be very important compared to the younger generation who regarded 9.5% of the ES to be very important. The older generation generally considered ES as more important, regardless of what ES, with the largest difference in cultural ES and especially questions related to spirituality and beliefs.

Figure 8: Differences in how the older and younger generation valuates ES.
An average of the answers in the different age-groups (old/young): Very Important: 3, Important: 2, Slightly important: 1, Don’t know: 0, Not important: -1
Figure 9: Differences in how the older and younger generation valuates ES

X-squared = 100.71, df = 4, p-value < 2.2e-16

Historical development, changes in management of the VFFs for the past

Key historical aspects of management of the VFFs were also included in the interviews among the villagers as well as with key informants (P. Zheng, personal communication September 2, 2014; H. Yu, personal communication, January 10, 2015) and are here presented as a complement to give possible explanations to the general decease in TEK we see today. Two political movements are identified as supposedly having the largest effect on this trend:

1. “The Cultural Revolution” in the 1960s-70s that abandoned old Confucian customs in Wuyuan. As a result of this supression, TEK-transfer between generations likely decreased during these years affecting degree of TEK among following generations.

2. The “Open Doors policy” beginning in 1978 which drastically increased China’s economic development resulting in lifestyle change, increased consumption habits and changed worldviews among chinese people. In Wuyuan, this had an effect on urbanisation, especially among the young in form of young people moving into urban areas for work, and the tourism explosion we have seen in the last decade.
### Table 2: Historical development that has had an effect on the VFFs in Wuyuan

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Development and Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-1949</td>
<td>Many villages in Wuyuan have been Confucian clan societies for close to a millennium. These societies were built on lineage groups arranged along the paternal line with strong informal institutions. Geomancy of <em>fengshui</em> was a strong part of the clan culture; each village had their landlords and village committees governing the landscape and its resources and harsh public punishments for collecting goods and fuel wood from the VFFs where in place, such as the “<em>kill pig protect mountain-tradition</em>” (see Table 1, “<em>Village fengshui forest</em>”).</td>
</tr>
<tr>
<td>1949-1978</td>
<td>During the revolutionary era the Clan culture was destroyed, especially during “The Cultural Revolution” (1966-76) and the hierarchical traditional society and everything that had to with ancestral worshiping, geomancy and old traditions were abolished. Many buildings and temples where destroyed. The power was taken away from landlords and Heads of the villages. However, the VFFs where not considered relics or traditional symbols, so many of them remained untouched. However, some VFFs and other forests in the area were logged already during the campaign “The Great Leap Forward” (1958-61) when rapid industrialisation, collectivization and land tenure reforms took place.</td>
</tr>
<tr>
<td>1978-2000</td>
<td>The implementation of the ”Open Doors Policy” in 1978 led to big market-economy reforms and a great shift in Chinas economy and trade with the world. In the 1980’s and 90’s the World Bank lent out money to many companies in China. Logging companies came to Wuyuan and deforested broad-leaved forest and planted needle leaved production forest in its place, mostly pines. Today about 40% of the total forested area consists of pines. Many VFFs where logged in places where informal village institutions on protecting VFFs had weakened. This led to a decrease in forest biodiversity. Zheng Panji, a forester in Wuyuan, drew attention to the destruction of the VFFs in the area in the 1990’s and talked to the villagers about the importance of maintaining these. His work gained publicity; enhancing existing institutions and culture of VFFs. Zheng Panji named the VFFs “small protected zones” however, about 50% of them are still only protected by informal institutions and not by the state.</td>
</tr>
<tr>
<td>2000-2015</td>
<td>Tourism development in a few villages and infrastructure development in combination with this, including urbanisation in form of young people moving into urban centres to work has rapidly changed people’s lifestyle and source of livelihood. Affordable prices of western medicine in combination with a growing cash economy changed the dependency nearby landscape provide medical herbs.</td>
</tr>
</tbody>
</table>
84-years old man about the history of the management of the VFFs:

“During the cultural revolution, and during the Great Leap Forward (1958-1961) not much of this forest was destroyed (VFF). Before the liberation (1949) no one dared to touch the forest. During the liberation years it was almost intact, some fuel wood was needed during the steel production time (Great Leap Forward) but all in all very little was destroyed. It was first after 1989-1990 they found different reasons to destroy the VFF. The BDMF where made up of various kinds of thick woods of for example Camphor and Pine before. When you went in there you almost couldn’t see anything. There are people saying that during the years when Guomindang came here to find soldiers to their army (1930s-40s), people run into the forest to hide, and where saved from being caught that way. Nowadays if you stand inside the forest you can see the mountaintop, the pines have all been logged in the 90’s. They found different excuses to log by then, and sold it....”

Limitations of this study and suggestions for future research

The difficulty in measuring changes over time in one single study

Measuring what happens with TEK over time by comparing older and younger generations this way has its limitations, since the old generations possible have changed opinions and collected more knowledge through time, and was taken in consideration when looking at the result. It could be interesting for future studies to look at what has happened to TEK in the same area by doing a follow up study on young people in the same area a decade from now.

Simple way of analysing data gives only rough measurements

Quantifying qualitative answers after a criteria table gives only a rough measurement of changes in TEK. It is expected that if the data set where analysed further, using a different set of data analysis, more distinct features of changes and differences between different groups could have been detected. Due to a large dataset (and a mix of English and Mandarin), quantifying the data after a criteria-table was the most
feasible way to answer the research question considering time and resources available for the study.

The difficulty in finding young people

Most young people were away in urban areas working so the young people interviewed can be considered “rare species” that for different reasons had stayed or was visiting the village at the time of the interview. If interviews with young people from Wuyuan living in urban centres would be included in the interviews, possible more distinct changes in Attitudes and TEK might be detected, due to that this group less time spends less time in the hometown landscape however this was not feasible in the scope of this study.

Challenges in detecting and measuring TEK in a formal interview-setting

TEK is often a form of tacit, imbedded knowledge that has developed through time from humans’ interaction with the environment, a knowledge in peoples minds that is often not documented, only transmitted orally (Pilgrim 2006). This form of knowledge is hard to detect and isolate as single facts. Finer structures of knowledge are therefore easily overlooked in an interview setting (Fazley, Fazley, Salisburg, Lindenmayer & Dovers, 2006). To gain a more accurate understanding for the scope of this tacit knowledge each individual possess regarding VFFs, it would be preferable to spend a long time with each and every interviewee. However this was not possible within the scope of this study. It could be of interest in a further study to complement this study with spending longer time with a few individuals in the landscape to get a deeper understanding for TEK. This would likely give more refined nuances complementing the more coarse statistical results presented in this study.
Discussion

By comparing TEK between older and younger generations, between men and women and between developed and less developed villages in Wuyuan, this research aims to answer what is happening with local communities’ TEK regarding VFFs when the area goes through modernisation in form of tourism development and urbanisation.

In general the interviews reveal a lack of the same in-depth, specialised knowledge on VFFs among young people, compared to the knowledge among the elders. This is mainly reflected in less explanatory answers to the ES-questions as well as in the “knowledge”-category of questions among the younger interviewees. The interviews also reveal a radical decline in spiritual believes connected to the VFFs in younger generations, pointing towards a less spiritual and possibly a less emotional connection to these forests.

Considering these results, it is not difficult to understand that the incentive to care for and value the VFFs is declining in correlation to the loss of knowledge of VFF, simply due to the fact that you don’t tend to care for things you don’t know. The observed trends of decrease of TEK, and the linked “Attitude-decline” in Wuyuan is echoed in other research showing how incentives to care for nature declines with less experience and knowledge of it (Pyle, 2003), i.e. how a person’s amount of connectedness to nature correlates with incentives to sustain or act environmentally, and that lack of emotional (affective relationship to the natural world) weakens the incentive to act environmentally (Kollmuss & Agyeman, 2010).

As pointed out earlier, many young people in China have over the past decade changed their worldview radically. The move from a collective to a more individualistic approach regarding goals and life-purposes is reflected in the differences between age groups in their answers in the Attitude-section, showing a shift from a long time perspective among the older generations towards a more short time oriented way of considering wealth and health among the younger generations, and from a collectivist perspective towards an individualistic perspective, including less incentive to protect and care for the VFFs.
Possible explanation to the “non-significant" results

The fact that there is no significant difference in TEK between developed and less developed villages can be explained by that most young people are affected by a modern lifestyle, in both developed and less developed villages, since a majority migrates into urban centres for livelihood at least during some years in their life. The villages studied are also located fairly close to each other; therefore it is highly likely that young people from less developed villages work in developed villages. Following the expansion of the areas infrastructure in recent years it is also easier to travel between villages. The older generation on the other hand all have similar background and have lived most of their lives in the area before it developed, so their thoughts and attitude are not likely to change significantly as a result of recent tourism development.

Results showing that women and men had similar depth of TEK, despite that women interviewed often were less educated, has likely got to do with that TEK not is a subject taught in school but rather a knowledge imbedded in a knowledge-practice-belief complex (Berkes 1999) attained rather with time spent and dependency on the landscape than with gender or education-level.

Reasons behind decrease in TEK

The decrease in TEK and changes in attitudes on a local scale likely relates to that Wuyuan communities’ livelihood for the past two decades has shifted from farming and gathering in the nearby landscape to other sources of income such as tourism and employment in urban centres, leading to less time spent and less dependency on the nearby landscape; the young people doesn’t need to acquire TEK for their survival to the same extent as earlier generations.

On a larger scale, the most significant drivers identified behind loss of TEK is driven by political changes in the society that first abandoned repressed old culture in the 1960’s and later, after economical reforms in 1978, entirely focused on economic development.

That economic development correlates to decrease in ecological knowledge are not special for Wuyuan, but a common phenomena in the world. Other research show
how this tendency generally increases in the first stages of economic development. (Pilgrim et al., 2008) which in Wuyuan is examplified in in the felling of old trees (including VFFs) in the area in the 80’s and 90’s, in the beginning of Chinas economic growth. The question now is whether or not TEK of VFFs will survive in the future when development in Wuyan in form of tourism exploitation continues?

The future of VFFs

Based on the changes mentioned, one could assert that TEK was weakened already during the revolutionary years. However, we can see that the fengshui landscape management and VFF culture in Wuyuan, at least to some extent, survived until modern days. It is worth pointing out that despite the trends shown in this research, there are still young individuals who shows in depth-TEK and puts high value on the VFFs today. This is likely due to that fengshui is a tenacious and persistent knowledge that modernisation has not been able to eradicate.

Despite this, in light of the general trend of TEK decrease in Wuyuan, it is reasonable to argue that the future of the Social Ecological System of the VFFs is threatened, due to that the informal institutions (Folk Regulation and customs) built and maintained by local communities on the basis of fengshui (TEK) are weakening.

Employment opportunities within the increasing tourism sector could have a mitigating/constricting effect on the younger generations migration and thus slow the trend of decreasing TEK simply because young people would spend more time in the nearby landscape.

However, large-scale tourism development could also have a negative impact on the survival of the system of VFFs if consideration to the local culture and customs are neglected when exploiting the area. Other threats to the VFFs are future land-use changes connected to development and exploitation.

Since China for the past twenty years has made large investments and sincere efforts to increase both forest cover and the health of these forests to stop the negative results from past deforestation it appears that acknowledging existing fengshui culture and customs sustaining the VFFs could benefit the government in its effort to sustain and conserve forest ecosystems.
In modern day China we can see many signs of revival of old culture and religion after the revolutionary years of supression (Vermander, 2009). Since 2005 it has been on the CCPs agenda to promote Confucian culture, through for example the political vision to create a ‘harmonious society’, as ways to find a Chinese cultural and political identity in a globalising world (Miller, 2010; Worsman, 2012). The revival of old values and the search for identity within the modern Chinese society could be seen as a window of opportunity of the survival of fengshui, and possibly of VFF and fengshui landscape management.

On the basis of this, it appears that acknowledging existing fengshui culture and customs sustaining the VFFs could benefit the government in its effort to sustain and conserve forest ecosystems alongside fulfilling its development goals. At the same time it would likely benefit local communities and the survival of SES of VFFs.

The Multiple Evidence Base Approach is a parallel approach for governance of biodiversity and ecosystems for human wellbeing, showing how using different approaches and knowledge systems in parallel could be beneficial as a strategy when governing and managing natural resources, especially when dealing with the challenges of ecosystem degradation and global environmental change (Tengö et al., 2014).

In a Chinese context a “parallel approach” might have its limits, due to constraints mentioned such as fussiness in land tenure laws and a top-driven political system that at time ignores local communities’ needs and desires. However, one way of enhancing and making use of existing local fengshui knowledge, parallel to reaching the governments (and other investors goals) of developing Wuyuan for tourism, could be to promote TEK of VFFs in this development, in combination with inclusion of VFFs in conservation policies. Further more, the health and continued survival of the interlinked social-ecological system of VFFs would require and benefit from involving local stewards in VFF management.

The word harmony (harmonious) is one of the “most cherished ideals in the Chinese culture” referring to old Confucian ideals (Chenyang Li, 2006).
**Suggestions for further studies**

_Fengshui_ is a complex system built on human relationship to the environment that has been little researched by the western scientific community, especially in the field of environmental management studies.

ES framework is a policy tool created to include and valuate services humans gain from nature in decision making which is extensively used for development or ecosystem restoration-projects in China (Chen 2013; Zhongmin et al. 2003). How to find ways to make ES valuation tools and especially assessment processes more inclusive to social and cultural contexts, such as _fengshui_ landscape management, could be of interest for future studies. To understand and integrate TEK of _fengshui_ when assessing ES (in areas where _fengshui_ culture and practice is in use), could likely sharpen the interpretation and help making closer estimations on the “real value” of services that the landscape provide to local communities.
Conclusion

This research has assessed what is happening with traditional ecological knowledge (TEK) regarding village fengshui forests (VFFs) when China modernises. This was done by comparing differences among younger and older generations in Wuyuan County in southeast China regarding: (1) knowledge about, (2) beliefs related to, (3) attitude towards, and (4) values associated with ecosystem services (ES) provided by the VFFs.

The result shows that TEK is declining significantly. In comparison with the younger generations, the older generation showed to have: 1. More in-depth knowledge regarding the VFFs, 2. Stronger beliefs related to the VFFs 3. Stronger willingness to put the VFFs over personal wealth (attitude); (4) the older generation also showed to valuate ES provided by the VFFs higher in general.

The decrease in TEK is likely related to less time spent and less dependency on the nearby-landscape among younger generations caused by change in livelihood, driven by China’s recent fast economic development. From a longer perspective TEK of VFFs likely started to declined during political campaigns in the 1960’s and 70’s in China when old culture, beliefs and traditions where suppressed.

If the VFFs, and the fengshui culture that have sustained these were acknowledge by higher authorities both for its cultural and ecological values, the future for the coupled SES of VFFs would get a chance to survive and get room to evolve further in the future.
References


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### Appendix 1: Village background information

<table>
<thead>
<tr>
<th>Name of the village, coordinates, inhabitants</th>
<th>Number of inhabitants</th>
<th>Village, built during what dynasty&lt;sup&gt;10&lt;/sup&gt;</th>
<th>1. Percentage of home-grown food</th>
<th>2: Percentage of income from tourism</th>
<th>Number of interviews Men 60-100 years old</th>
<th>Number of interviews Woman 60-100 years old</th>
<th>Number of interviews Men 18-36 years old</th>
<th>Number of interviews Woman 18-36 years old</th>
<th>Total amount of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hongguan/Lingjiao&lt;sup&gt;11&lt;/sup&gt; (虹关／岭脚) 29.518315, 117.899607</td>
<td>606 (Hongguan) + 635 (Lingjiao)</td>
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<td>1: 86% 2: 10% or less</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>9</td>
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<td>4</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td></td>
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<td>4</td>
<td>4</td>
<td>2</td>
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<td>Tang and/or Song</td>
<td>Info. provided by Wuyuan Public Security Department</td>
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</tr>
<tr>
<td>Xiaoqi (晓起) 29.391810, 118.029883</td>
<td>1117</td>
<td>Tang and/or Song</td>
<td>1: 48% 2: 63%</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Likeng (李坑) 29.323898, 117.931521</td>
<td>1200</td>
<td>Tang and/or Song</td>
<td>1: 69% 2: 77%</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Jiangwan (江湾) 29.369087, 118.053401</td>
<td>2604</td>
<td>Tang and/or Song</td>
<td>1: 48% 2: 48%</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td><strong>Total amount of interviews:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>25</strong></td>
<td><strong>23</strong></td>
<td><strong>25</strong></td>
<td><strong>21</strong></td>
<td><strong>94</strong></td>
</tr>
</tbody>
</table>

<sup>10</sup> Tang dynasty: 618–907 AD, Song dynasty: 960–1279AD, Ming dynasty: 1368–1644 AD

<sup>11</sup> Hongguan (虹关) and Lingjiao (岭脚) are two villages that are situated very close to each other geographically so they were counted as one village.

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Blue colour = Less developed villages  
Green colour = Villages developed for tourism
Inhabitants in Hongguan, Lingjiao, Shiji, Dalian, Zhankeng, Chikeng and Yankeng foremost livelihood comes from farming. Along with the tourism development most families only grow rice once a year. In recent years tea-production has increased, and another proportion of the population are migrant workers in urban areas. In addition, some are making a little income from tourism. Around 80% of what people eat in these villages comes from home-grown food, including pig- and fish-farming.

Jiangwan, Xiaqiu, Likeng and Wangkou are all tourist-spots. About 60-70% of the inhabitants income comes from tourism. About 20-30% of the inhabitants have it as a single source of income, while 40-50% as an additional source of income. Everything else is comes from self-sufficiency (farming etc.).
Tourism development:

Number of visitors to Wuyuan per year from 2000-2014 (in millions of visitors)

<table>
<thead>
<tr>
<th>Year</th>
<th>Visitors (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.125</td>
</tr>
<tr>
<td>2003</td>
<td>1.38</td>
</tr>
<tr>
<td>2005</td>
<td>2.347</td>
</tr>
<tr>
<td>2006</td>
<td>4.09</td>
</tr>
<tr>
<td>2008</td>
<td>4.1</td>
</tr>
<tr>
<td>2009</td>
<td>4.81</td>
</tr>
<tr>
<td>2010</td>
<td>5.08</td>
</tr>
<tr>
<td>2012</td>
<td>8.33</td>
</tr>
<tr>
<td>2013</td>
<td>10.07</td>
</tr>
<tr>
<td>2014</td>
<td>12.7</td>
</tr>
</tbody>
</table>

1 Information on number of inhabitants and historical data comes from Wuyuan Public Security Department (婺源公安部). Tourist-data comes from Wuyuan Tourism Ministry (婺源旅游局) and village background data on livelihood and income from tourism comes from Wuyuan Forestry Ministry (婺源林业局). All information was collected and provided by Huang Xuewen (黄学文) at Wuyuan Forest Bureau, department for public forest (婺源林业局公益林办公室)
Appendix 2: Position of villages in Wuyuan County, Jiangxi Province were interviews where performed
(For coordinates, see Appendix 1)

Map source: Google maps (2015)
## Appendix 3: Interview questions and criteria table
(Used for converting qualitative data to quantitative data)

<table>
<thead>
<tr>
<th>Question</th>
<th>Question category</th>
<th>Rating criteria</th>
<th>Hypothesis that the rating scale is based on and/or explanation to how the question was developed and analysed.</th>
</tr>
</thead>
</table>
| 1. Where are the "back dragon mountain forest", and the "water gate forest" situated, do you know? | Knowledge         | -Knows and explains (shows): 3  
- Says he/she knows: 2  
- Knows one but not the other: 1  
- Doesn’t know: 0 | If the interviewee says that they know where the VFFs are situated it is considered the truth. An inventory of the spot of the VFFs where done before interviewing villagers in each village. The question was analysed separately and in combination with the other “knowledge-questions” |
| 2. Why is the forest situated over there? Does this forest have any certain purposes? What is the forests function? Does it have any advantages (for you)? | Knowledge         | -Tells many (or more) functions with explanation  
- Tells some (2-3) functions with explanation: 2  
- Tells 1 function, no explanation: 1  
- No function (don’t know): 0 | The hypothesis here is that amount of functions and understanding of the processes of these functions shows the depth of knowledge the interviewee has regarding the VFF. All functions are regarded as having the same relevance when quantizing the data. The question was analysed separately and in combination with the other “knowledge-questions” |
| 3. Are there any differences between the VFFs and other forests?         | Knowledge         | - Says there is a big difference and explains clearly why: 3  
- Say there is a difference but don’t give any examples: 2  
- Says there is no big difference: 1  
- Says there is no difference/ Don’t know: 0 | According to fengshui, the place of the VFFs and their function and meaning are different from other forest patches (See “Basic concepts of fengshui - the role of VFFs in the “fengshui-landscape”)
It is assumed that if you know that they are different and explain why according to basic fengshui principles/ecosystem principles, you have an in-depth knowledge. The question was analysed separately and in combination with the other “knowledge-questions” |
| 4. Are there any special trees or species in this forest that is special to you/the community you live in? Can you          | Knowledge         | - Tells a lot and explains: 3  
- Tells some: 2  
- Tells very little: 1  
- Don’t know: 0 | It is assumed that if you know more species and/or their services/functions you have more in-depth knowledge about the VFFs. The Camphor trees special status in the community was the most commonly mentioned tree and if |
<table>
<thead>
<tr>
<th>Question</th>
<th>Knowledge</th>
<th>Livelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Looking at this landscape as a whole, does the forest have anything to do with <em>fengshui</em>? What does the forest have to do with the <em>fengshui</em>?</td>
<td>- Explains thoroughly why and shows to have an understanding of general concepts of <em>fengshui</em>: 3</td>
<td>- Yes a lot, tells some species: 3</td>
</tr>
<tr>
<td></td>
<td>- Answers yes, with some explanation: 2</td>
<td>- Yes some: 2</td>
</tr>
<tr>
<td></td>
<td>- Answers yes with no explanation: 1</td>
<td>- Very little: 1</td>
</tr>
<tr>
<td></td>
<td>- Don’t know/I don’t think so: 0</td>
<td>- No: 0</td>
</tr>
<tr>
<td>6. Tell me a little bit about what <em>fengshui</em> is. What is it according to your understanding? (I don’t know because I am a foreigner)</td>
<td>- Explains a lot, some examples: 3</td>
<td>- Very Important: 3</td>
</tr>
<tr>
<td></td>
<td>- Explains some, 1-2 examples: 2</td>
<td>- Important: 2</td>
</tr>
<tr>
<td></td>
<td>- 1 example, no explanation: 1</td>
<td>- A bit important: 1</td>
</tr>
<tr>
<td></td>
<td>- Don’t know/ I don’t believe in <em>fengshui</em>: 0</td>
<td>- Don’t know: 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Not important: -1</td>
</tr>
<tr>
<td>7. Do you consider <em>fengshui</em> in your daily life? Tell me when you consider <em>fengshui</em>?</td>
<td>- Yes a lot, gives several examples of when: 3</td>
<td>- Analysed in the ES validation</td>
</tr>
<tr>
<td></td>
<td>- Yes some, one or two examples: 2</td>
<td></td>
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<tr>
<td></td>
<td>- Little, no example: 1</td>
<td></td>
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<tr>
<td></td>
<td>- No: 0</td>
<td></td>
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<tr>
<td>8. Do you harvest anything from the VFFs, like fruits, mushrooms or herbs?</td>
<td>- Yes a lot, tells some species: 3</td>
<td></td>
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<td></td>
<td>- Yes some: 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Very little: 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- No: 0</td>
<td></td>
</tr>
<tr>
<td>9. How important are these goods for you?</td>
<td>- Very Important: 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Important: 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- A bit important: 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Don’t know: 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Not important: -1</td>
<td></td>
</tr>
<tr>
<td>10. Did you harvest more from the VFF 20 years ago?</td>
<td>Used to estimate livelihood change (from the VFF)</td>
<td></td>
</tr>
<tr>
<td>11. How come this forest has been kept for so long and the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management/Knowledge about Data used qualitatively (no</td>
<td></td>
<td>This question was not analysed quantitatively due to that the answers</td>
</tr>
<tr>
<td>Question</td>
<td>Domain/Knowledge about the forest management</td>
<td>Data used qualitatively (no rating)</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>12. How long has the fengshui forest been protected? Did it start before or after you were born?</td>
<td>Management/ Knowledge about the forest management</td>
<td>Data used qualitatively (no rating)</td>
</tr>
<tr>
<td>13. Has the forest been managed differently through the past 100 years? Can you tell me something about the management of the forest before, during and after Mao. How was it before 1949, how was it before and after the cultural revolution, and after 1978? How do you get punished if you cut this forest now/before?</td>
<td>Management/ Knowledge about the forest management</td>
<td>Data used qualitatively (no rating)</td>
</tr>
</tbody>
</table>
| 14. If this forest was cut down to develop this village further and you would gain from it economically, what would you think of it? | Attitude regarding the VFFs | -The forest is more important than personal material benefits, explains why and are very determined: 3  
-If I can gain from it economically I will say yes, because I treasure my valuables high, but I care some about the forest: 1  
-I don't know, I don’t want to answer: 0  
-I accept it if I get personal material benefits, I don’t care about the forest, I would happily have them cut it down:-1 | Using a possible scenario, considering recent changes in the area for the past 15 years, was supposed to make the question more “real” for the villagers.  
This question was analysed separately and together with Q15. |
15. If you consider the loss of this forest being removed, compared to if you would loose something of value to you in your home, which one is most important? What is of most value to you?

| Attitude regarding the VFFs | “-Thinks that the forest is much more important! Explains why: 3
- The forest is a bit more important, (maybe a bit hesitation): 2
- Even though the forest is important, my own stuff is more important: 1
- I don’t know/don’t want to answer: 0
- Off course, my own stuff! I don’t care about the forest: -1” | This question was analysed separately and together with Q14. |

16. Is this true or not: When there are lots of trees in the VFF, the people in the village will become older?

| Beliefs | “-Yes, that’s true: 3
- It make sense: 2
- It doesn’t have direct correlation, but it has positive impact/makes a little sense: 1
- I don’t know: 0
- No, that’s superstition: -1” | This question was analysed together with the other belief-questions |

17. Is this true or not: When there are lots of trees in the VFF people in the village will become wealthier?

| Beliefs | “-Yes, that’s true: 3
- It make sense: 2
- It doesn’t have direct correlation, but it has positive impact/makes a little sense: 1
- I don’t know: 0
- No, that’s superstition: -1” | This question was analysed together with the other belief-questions |

18. Does the VFF protect malignant qi? Is that important or not?

| Cultural ES/Beliefs | “-Yes, that’s very important: 3
- Yes, that’s important: 2
- Maybe, a bit important: 1
- Don’t know: 0
- No, (I don’t believe in that) that’s not important: -1” | This question was analysed separately, together with the other belief-questions and together with the “ES-questions” |

Questions on Ecosystem services (ES)12

<table>
<thead>
<tr>
<th>Type of Ecosystem Service:</th>
<th>Degree of Importance</th>
</tr>
</thead>
</table>
| Provisioning ES           | “- Very Important: 3
- Important: 2
- A bit important: 1
- Don’t know: 0
- Not important: -1” | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |

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12 Before the ES-questions where asked it was explained to the interviewee that he/she had the option to answer if the VFF provided the presented service and then answer whether they regarded that particular service as: very important, important, little important or not important.
<p>| | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
</table>
| 20. Is the soil-nutrition good in the VFF? (Better than other places?) Is that important or not? | Supporting ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 21. Does the VFF make the air better? Is that important or not? | Supporting ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 22. Do you enjoy walking and looking at different birds, animals and plants in the VFF? Is that important or not? | Supporting ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 23. Does the VFF have a cooling effect for the village in the summers? Is that important or not? | Regulating ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 24. Does the VFF protect the village from erosion? Is that important or not? | Regulating ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 25. Does the VFF protect against storms/winds? Is that important or not? | Regulating ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 26. Does the VFF protect against floods? Is that important or not? | Regulating ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 27. Does the VFF protect against drought? Is that important or not? | Regulating ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0  
-Not important: -1 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
| 28. Is the VFF of help for the tourism industry (does it have potential for tourism development) | Cultural ES | -Very Important: 3  
-Important: 2  
-A bit important: 1  
-Don’t know: 0 | ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit. |
<table>
<thead>
<tr>
<th>Question</th>
<th>Importance Levels</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>29. Does the VFF protect against malignant qi? Is that important or not?</td>
<td></td>
<td>This question where analysed separately, together with the other belief-questions and together with the “ES-questions”</td>
</tr>
<tr>
<td>30. Is the VFF good for recreation purposes, do you feel relaxed/do you enjoy being in the VFF? Is that important or not?</td>
<td></td>
<td>ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit.</td>
</tr>
<tr>
<td>31. Does the VFF beautify the village? Is that important or not?</td>
<td></td>
<td>ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit.</td>
</tr>
<tr>
<td>32. Is the VFF part of the villages’ cultural heritage? Is that important or not?</td>
<td></td>
<td>ES questions where analysed by category (Provisioning, Supporting, Regulating, Cultural services) and together as one unit.</td>
</tr>
</tbody>
</table>
The answers where recalculated in a different way regarding the ES-category of questions, giving an extra 0.5 points to people who explained the service or why it was important, this was done because the impression some people didn’t make a great distinction between important and very important. In these calculations 47.5% of the ES where regarded as very important or important with explanation among the older generations compared to 21.5% among the younger generations.

Extra Figure: Differences in how the older and younger generation valuates ES

Counting ES using a finer scale: Very Important: 3. Important with explanation: 2.5, Important: 2, A bit important with explanation or important with hesitation: 1.5. A bit important: 1. Don’t know: 0, Not important: -1

X-squared = 126.04, df = 4, p-value < 2.2e-16

Typical example reflecting how (some) woman answered questions, revealing little confidence in their own knowledge and views about women's position in the family and society in general (on question on fengshui-practices and if the VFF protects against malignant qi):

73-years old woman (comment 20):

“I don’t know, that’s the men’s business, the family matters. Because men are educated, women are not. If you don’t understand you don’t take charge because if
you would, you wouldn’t handle things in a good way. The woman should make food, take care of the kids and raise the pigs, that’s enough."..."We old people don’t know, we don’t know Chinese characters (don’t know how to read and write). But important, yes it is important! The Camphor tree is good! The Camphor tree has a spirit that protects the children.