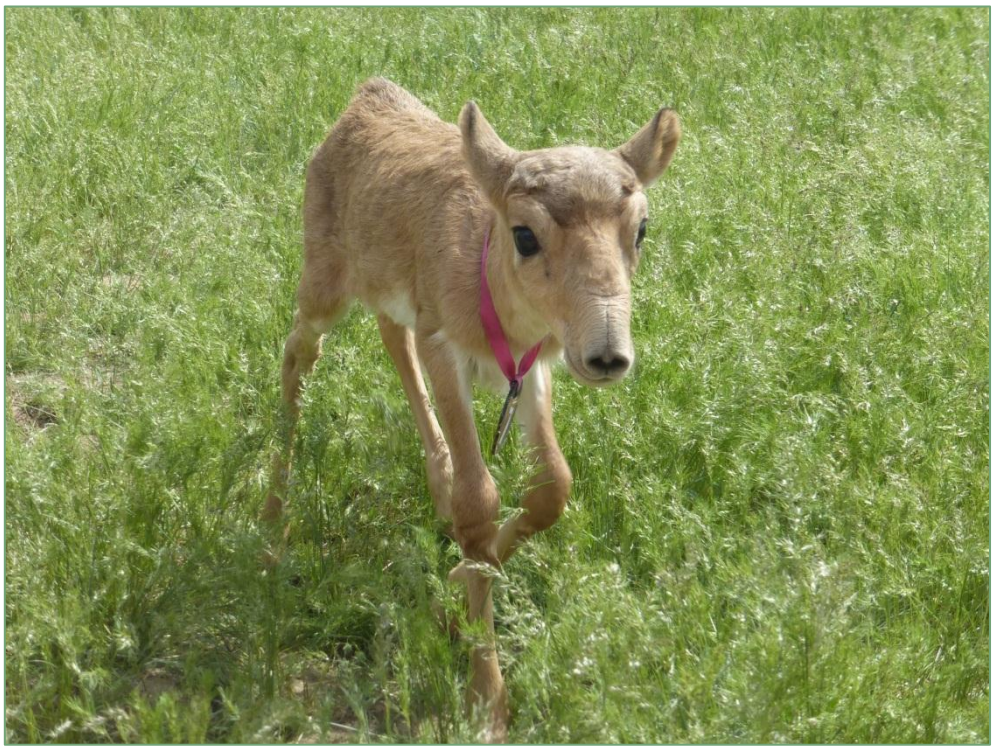
Imperial College London

Factors affecting intention to volunteer: Conserving the Ural saiga population



Katie Mabbutt

September 2014

A thesis submitted for the partial fulfilment of the requirements for the degree of Master of Science at Imperial College London

Submitted for the MSc in Conservation Science

DECLARATION OF OWN WORK

I declare that this thesis, Factors affecting the intention to volunteer: Conserving the Ural saiga population, is entirely my own work, and that where material could be construed as the work of others, it is fully cited and referenced, and/or with appropriate acknowledgement given.

Signature

Name of student Katie Mabbutt

Name of supervisor(s) Professor E.J. Milner-Gulland
Carlyn Samuel

Table of Contents

Table of Contents ii
LIST OF FIGURES iv
LIST OF TABLES iv
LIST OF ACRONYMS v
ABSTRACT vi
ACKNOWLEDGEMENTS vii
1 INTRODUCTION 1
1.1 Problem statement 1
1.2 Study aims and objectives 3
2 BACKGROUND 4
2.1 Changing behaviour 4
2.2 Theoretical frameworks for behaviour change 5
2.2.1 Social learning theory 5
2.2.2 Responsible environmental behaviour 5
2.2.3 Theory of Planned Behaviour 6
2.3 Interventions for behaviour change 9
2.4 Measuring motivation to volunteer 10
2.5 Behaviour change in conservation 11
2.6 Conservation evaluation 12
2.7 The saiga antelope 13
2.7.1 Saiga behaviour and ecology 13
2.7.2 Historical and current populations 14
2.7.3 Cultural importance 15
2.7.4 Kazakhstan and it's people 15
2.7.5 The Ural saiga population 16
2.7.6 Saiga conservation in Ural to date 16
3 METHODS 19
3.1 Methodological framework 19
3.2 Study design 19
3.2.1 Questionnaire design and pilot 20
3.2.2 Knowledge section 20
3.2.3 Attitude section 20
3.2.4 TPB section 21
3.2.5 Saiga Day Quiz 22
3.3 Pilot 22
3.4 Questionnaire procedure 23
3.5 Saiga Day quiz procedure 23

3.6 Statistical analysis 24
3.6.1 Knowledge, Attitude and WTH analysis 25
3.6.2 TPB Components 25
3.7 Ethics 25
4 RESULTS 26
4.1 Determinants of knowledge 26
4.2 Perceived threats and interventions 27
4.3 Determinants of attitudes 29
4.4 Extent of willingness to help 30
4.5 Determinants of behavioural intention 32
4.6 Influence of Steppe Wildlife Club membership 34
5 DISCUSSION 36
5.1 Knowledge and attitudes towards saiga conservation 36
5.2 Factors that influence participation in saiga conservation 39
5.3 Conservation of saigas: threats and interventions 42
5.4 Recommendations for future conservation interventions in Ural 43
5.5 Recommendations for future research 44
5.6 Concluding remarks 44
6 REFERENCES 45
7 APPENDICES 52
7.1 Appendix I - Questionnaire 52
7.2 Appendix II – Children's SD Quiz 59
7.3 Appendix III – Adult's SD Quiz 64
7.4 Appendix IV – Minimal adequate models 69
7.5 Appendix V – Maximal models 72

LIST OF FIGURES

Figure 2.1 Bandura's social learning theory (1977) 5
Figure 2.2 Hines, Hungerford and Tomera's model of responsible behaviour (1987) 6
Figure 2.3 Ajzen's Theory of Planned Behaviour (1991) 7
Figure 2.4 Saiga populations distributed in Kazakhstan. 1. Pre-Caspian, 2. Ural, 3. Ustyurt, 4. ... 13
Figure 2.5 Map of target villages for public engagement events (SCA, 2012) 17
Figure 3.1 Ajzen's (1991) Theory of Planned Behaviour adapted for this study 19
Figure 4.1 Difference between knowledge scores of employment status categories 27
Figure 4.2 Difference between knowledge scores of two villages 27
Figure 4.3 Difference between the attitude scores of two villages 30
Figure 4.4 Theory of planned behaviour with significance of each component 33
Figure 4.5 Difference between knowledge scores and SWC membership 35

LIST OF TABLES

Table 2.1 Behaviour change techniques (DeYoung, 1993) 9
Table 3.1 Landis and Koch's (1977) Interpretive Guide to Kappa Agreement 24
Table 4.1 Number of respondents for each section of the questionnaire 26
Table 4.2 Summary of GLM for knowledge section of questionnaire 26
Table 4.3 Perceived threats to saiga population 27
Table 4.4 Ranked responses for most effective interventions to improve the status of saigas 28
Table 4.5 Kappa statistic of agreement for interventions 28
Table 4.6 Kappa statistic of agreement for attitudes 29
Table 4.7 Summary of GLM for attitude section of questionnaire 29
Table 4.8 Volunteer activities respondents would be prepared to do 30
Table 4.9 Summary of GLM for willingness to help section of questionnaire 31
Table 4.10 Summary of GLM for Theory of Planned Behaviour components 32
Table 4.11 Kappa statistic of agreement for Theory of Planned Behaviour components 34
Table 4.12 Summary of GLM for influence of SWC membership 35

LIST OF ACRONYMS

ACBK	Association for the Conservation of Biodiversity of Kazakhstan
CMS	Convention of Migratory Species
CVM	Contingent Valuation Method
GLM	Generalized Linear Model
IUCN	International Union for Conservation of Nature
PBC	Perceived Behavioural Control
REB	Responsible Environmental Behaviour
SCA	Saiga Conservation Alliance
SD	Saiga Day
SLT	Social Learning Theory
SWC	Steppe Wildlife Club
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
WTH	Willingness to Help
WTP	Willingness to Pay

ABSTRACT

Understanding human behaviour is central to implementing effective conservation strategies. Conservation should work in an integrated way with other disciplines to utilise their expertise on behaviour change. However, a review of the literature shows that there is a lack of inter-disciplinary work between conservation and the social sciences. Previous research has failed to utilise theoretical frameworks developed by social science in order to understand human behaviour change. To address this problem this thesis applies the Theory of Planned Behaviour to understand what drives intentions to volunteer for conservation programmes. A survey of two villages in West Kazakhstan was conducted to assess respondent's attitudes, knowledge and willingness to volunteer to conserve saiga. The impact of attending saiga awareness and education events was also assessed. The Theory of Planned Behaviour was found to be an effective framework for ascertaining the drivers of behavioural intention. From this, recommendations were made for future conservation interventions in the region, as well as recommendations for future research which may be of interest to the wider field of conservation.

Word Count: 14,364

ACKNOWLEDGEMENTS

Firstly I would like to thank my supervisors Prof E.J. Milner-Gulland and Carlyn Samuel for their invaluable guidance and support throughout this study. I am grateful to the SCA, Flora and Fauna International's Ustyurt Landscape Conservation Initiative funded by USAID, People's Trust for Endangered Species and Disney Wildlife Conservation Fund for funding and supporting this research.

I would especially like to thank everyone at ACBK for giving me such a warm welcome to Kazakhstan and taking care of all the logistical arrangements for my fieldwork; particularly Zhanna Axartova and Vera Voronova, who went above and beyond their duty to ensure that I had an unforgettable experience.

'Rahmet' to the research team; Yerlan, Esenzhan, Gulmira, Gaukhar, and Zhansaya; and the driver Maxut for their hard work and good humour.

Finally I would l thank my fellow members of 'Team Saiga'. Forrest Hogg for his collaboration in development of the saiga day quiz, and his motivating updates from Kalmykia. Sophie Elliott for making the trip to Kazakhstan a truly memorable experience and being a great source of support throughout the field work and beyond.

1 INTRODUCTION

1.1 Problem statement

Global biodiversity is changing at an unprecedented rate (Pimm et al., 1995), and illegal use of natural resources is one of the major causes of continued biodiversity loss (Gavin et al., 2010). Illegal resource use can affect, amongst many other things, the conservation of endangered species (Burton, 1999), with this study focusing on the saiga antelope (*Saiga tatarica tatarica*) which is critically endangered (IUCN, 2008). Since the collapse of the Soviet Union in 1991 the saiga population has faced a rapid decline of 95%. The decrease in population was a result of dramatically elevated levels of poaching and the illegal trade of saiga horns and other products such as meat (Milner-Gulland et al., 2001). The impact of illegal resource use can vary not just due to biological factors, but also socio-economic ones (Gavin et al., 2010). It is increasingly recognized that conservation is dependent on human attitude and behaviour (Balmford and Cowling, 2006), so any intervention to conserve a species should consider the role of humans as both part of the problem and the solution. To achieve this conservation science should work in an integrated way with disciplines such as economics, psychology, political science, ethics, business management, marketing, anthropology, and other disciplines spanning the social sciences and humanities (Kareiva and Marvier, 2012).

Psychology, in particular, offers a framework to gain a better understanding of the human-nature experience and what motivates people to protect such relationships. As experts in human behaviour, psychologists have a number of approaches for understanding the cognitions, attitudes, motives, beliefs, values and types of behaviour related to conservation issues, from which the field of conservation psychology has emerged (Saunders, 2003). A key research topic in conservation psychology is the study of conservation behaviours; this is any activity that supports sustainability by either reducing harmful behaviours or by adopting helpful behaviours. Additional research areas related to conservation behaviour explore strategies that engender behaviour change, and how to measure the success of any such strategies.

However, conservation psychology is still a relatively new field, so it has yet to make major contributions to the design and implementation of programs to foster change in conservation behaviour (McKenzie-Mohr, 2000). The success of any contribution made by conservation psychology should be based on the difference it makes to overarching conservation goals, and needs to be monitored and evaluated in collaboration with conservation scientist (Saunders, 2003). However, this is not as straightforward as it may seem as there are two consistent problems in conservation science; the difficulty of converting scientific knowledge into conservation practice and lack of monitoring and evaluation of conservation actions (Pullin and Knight, 2001). Additionally much of current conservation practice is based on anecdotal information rather than review of the evidence. This has led to a call for a more evidence-based approach to conservation (Sutherland et al., 2004).

Another challenge for conservation is how it communicates key messages to the public effectively (Miller, 2005). Conservation has failed to do this successfully in the past. This has been attributed in part, to the assumption made by conservation that education alone will be sufficient to motivate people to change (Kaplan et al., 1998). It has been suggested that to truly engage the public with conservation, strategies that encourage the participation of the general public should be used. By engaging the public, both young and old, in formal and informal conservation interventions it can bring potential benefits to both humans and wildlife (Miller, 2005).

Taking into consideration all of the above, this study will aim to evaluate and the effectiveness of public engagement activities to increase awareness of the problems facing saigas, implemented jointly by the Saiga Conservation Alliance (SCA) and the Association of Conservation for Biodiversity in Kazakhstan (ACBK). Public engagement activities were first implemented in the study area in 2010, targeting both adults and children. The aim of the ongoing campaign is to promote positive attitudes and behaviour towards the conservation of the saiga.

The study will also explore what factors are linked to participation in conservation initiatives. Motivation to participate in conservation can come from three sources: other people, the environment, and one's self (DeYoung, 1996). It is important to understand the motivations that lead people to participate in conservation projects so that any intervention or incentive can be tailored to the target group (Souto et al., 2014).

1.2 Study aims and objectives

Aim: To evaluate the effectiveness of public engagement activities in changing attitudes, behaviour and norms towards saiga conservation in the Ural region of Kazakhstan.

Objectives:

1. To evaluate levels of knowledge and attitudes towards conserving saiga and to explore any difference between socio-demographic groups, and those who do and do not attend engagement events.

2. To identify the factors that influence intention to personally participate in saiga conservation using the Theory of Planned Behaviour.

3. To establish people's perceptions of threats to saigas and their conservation requirements.

4. To make recommendations for future awareness campaigns and saiga conservation within the target villages that can be adapted for use in other range states.

2 BACKGROUND

2.1 Changing behaviour

The goal of environmental awareness and education has been described as 'developing a world population that … has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones' (UNESCO-UNEP 1976). Achieving long lasting behaviour change is a major challenge for the field of conservation, and requires looking towards other disciplines.

The study of behaviour grew from within the field of psychology and can be condensed into the basic elements of stimulus and response. These responses may include cognitive elements, unobservable mental processes and choice in moderating behaviour (Heimlich and Ardoin, 2008). Conservation education and awareness uses a variety of strategies to encourage specific behaviours, thoughts, attitudes and intentions to change. Some that are frequently used in conservation education and awareness are the study of overt behaviour, covert behaviour, behavioural antecedents and consequences (Pearce and Hall, 1992).

An example of eliciting behaviour change in conservation is the use of classical conditioning in the form of repeated environmental messages. This can achieve simple behaviour changes without any conscious decision making from the recipient. Although, with this there is a risk that people become desensitised to these type of messages (Pearce and Hall, 1992). For more complex conservation behaviours second-order conditioning can be used. An example of this is encouraging people to recycle (second order stimulus) by teaching them to use a recycling bin to separate recyclables (first order stimulus). The problem with this strategy is that if the first order stimulus is not available (recycling bin) the second order stimulus (recycling) may not occur.

Focussing on the behavioural outcome, rather than the steps required to achieve the outcome, is a common mistake made by conservation practitioners (Frick et al., 2004). Therefore, it is necessary to be able to break down the particular components that lead to a specific behaviour (Monroe, 2003). In order to accomplish this, the use of theoretical frameworks is a valuable tool.

2.2 Theoretical frameworks for behaviour change

Many models on behaviour change have been developed. In this section I will discuss the most relevant models to conservation.

2.2.1 Social learning theory

Social Learning Theory (SLT) presumes that people learn from one another and the environment via observation, imitation, modeling and through the observation of rewards and punishments (Figure 2.1).

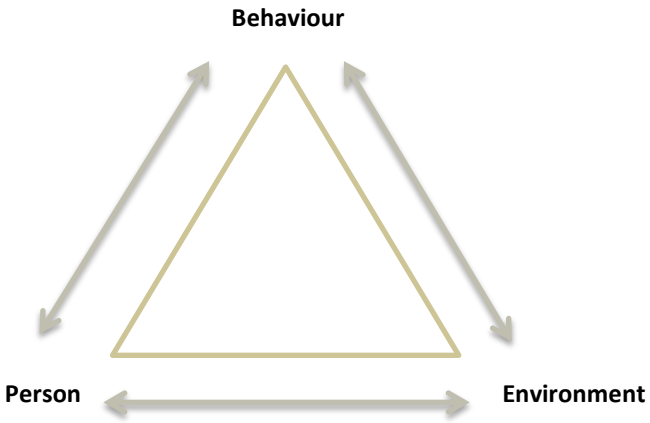


Figure 2.1 Bandura's social learning theory (1977)

SLT aims to address real-life problems in the context of the community in which it occurs (Heimlich and Ardoin, 2008). SLT is relevant to conservation education and awareness, as it proposes that behaviours are learned from others and are more effective when practiced in the community where it will be used. For example, a study that explored the pro-environmental behaviour of composting in a public area, found that people were more likely to compost if they had witnessed the person before them perform the task (Sussman and Gifford, 2013).

2.2.2 Responsible environmental behaviour

The model of Responsible Environmental Behaviour (REB) moved away from earlier thinking that increasing knowledge or changing attitudes alone could result in behaviour change. REB incorporates factors of personality, knowledge of issues and possession of the

appropriate skills, and recognises that any intention to act is mediated by situational factors (Figure 2.2).

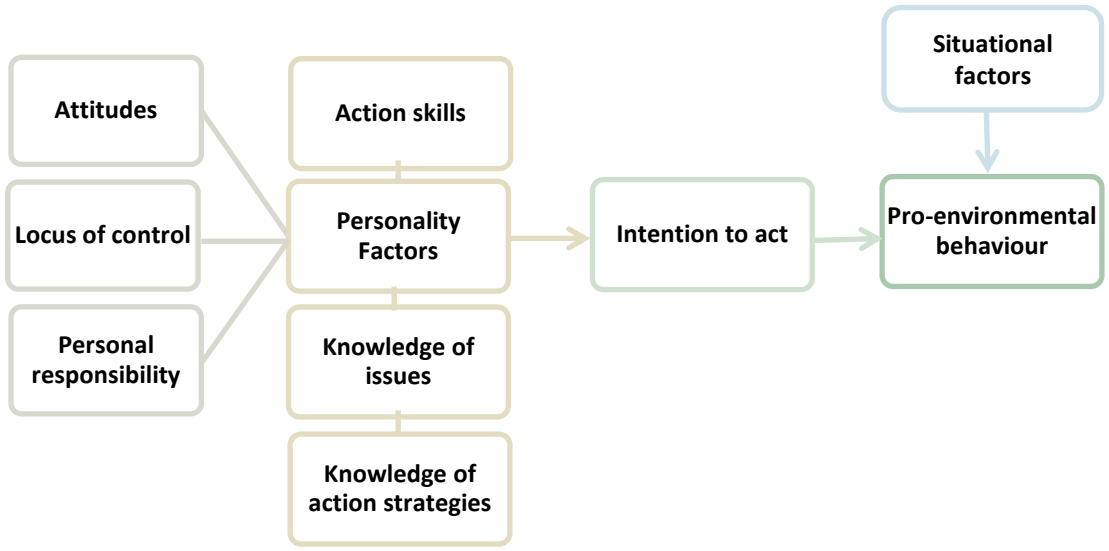


Figure 2.2 Hines, Hungerford and Tomera's model of responsible behaviour (1987)

REB makes the assumption that this common set of factors lead to responsible environmental behaviour. However, not all research supports this conclusion (McKenzie-Mohr et al., 1995). Oskamp et al. (1991) carried out three studies looking firstly at a wide-range of pro-environmental activity, then specifically at composting and thirdly investment in energy efficiency. It was found that different environmental behaviours have low positive correlations with one another and do not have a common set of factors. Instead this indicates that each form of environmental behaviour has a separate set of indicators.

2.2.3 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) developed from the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980). In the TPB, behaviour is guided by three factors; behavioural beliefs, normative beliefs and control beliefs. Behavioural beliefs produce a favorable or unfavorable attitude toward the behaviour. Normative beliefs result in subjective norm. Control beliefs give rise to perceived behavioural control (PBC).

The definition of these terms are:

- Behavioural belief – the subjective probability that the behaviour will produce a given outcome.
- Normative belief – the perceived behavioural expectations of such important referent individuals or groups as the person's family and friends
- Control belief – the perceived presence of factors that may facilitate or impede performance of a behaviour
- Attitude – the degree to which performance of the behaviour is positively or negatively valued
- Subjective norm –the perceived social pressure to engage or not to engage in a behaviour
- Perceived behavioural control – a person's perception of their ability to perform a given behaviour
- Intention - an indication of a person's readiness to perform a given behaviour

The attitude toward the behaviour, subjective norm, and perceived behavioural control collectively contribute to the formation of a behavioural intention. Finally, given a sufficient degree of actual control over the behaviour, people are expected to carry out their intentions when the opportunity arises (Figure 2.3).

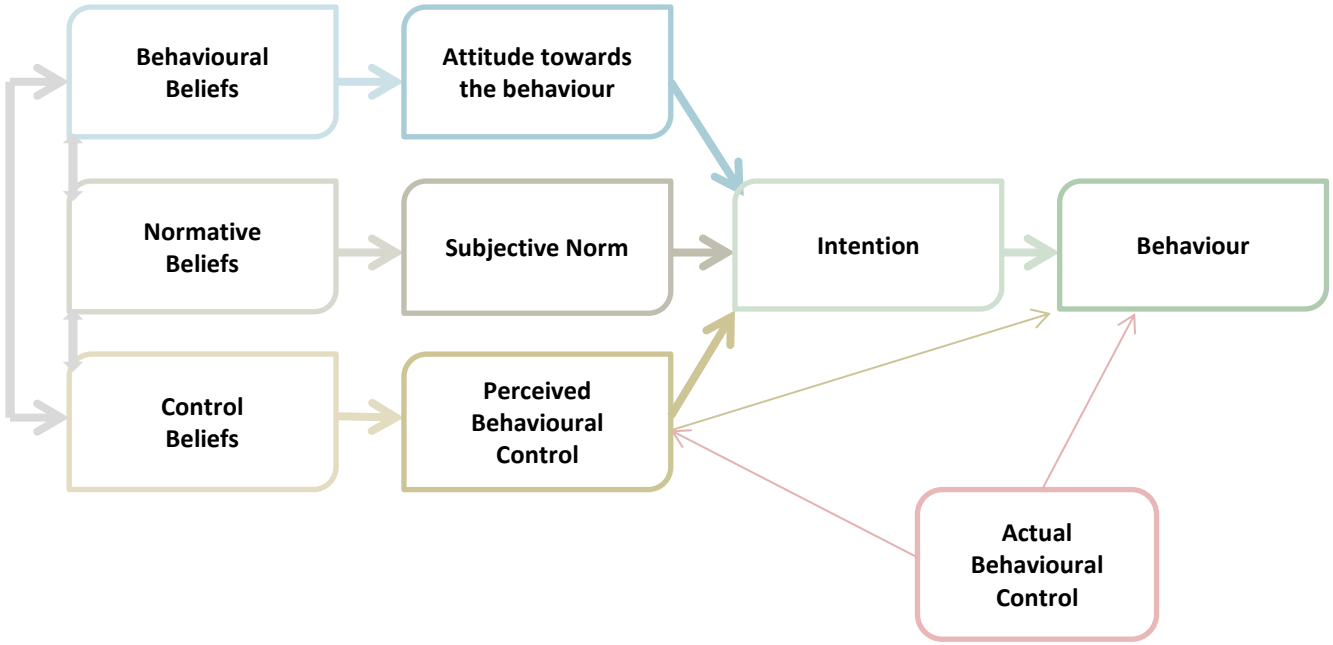


Figure 2.3 Ajzen's Theory of Planned Behaviour (1991)

The TPB is the model most commonly used by psychologists interested in understanding behaviour, and has been widely used in the exploration of different health behaviours (St John et al., 2010). There are very few examples of the TPB being used within conservation. One example is a study that looked at farmers who had already planted trees on their land, and those who had not. Both had a positive attitude towards farm forestry, suggesting that other factors must influence farmer's decisions to engage in farm forestry. Bu using the TPB this study found that subjective norms were most important in predicting pro-conservation behaviours in this context (Zubair and Garforth 2006).

The relative importance of the three direct measures of the TPB tends to differ from one behaviour to another (Ajzen, 1991). Fortunately, TPB is easily adaptable to reflect any context or environment so can be tailored to a specific project (Vining and Ebreo, 2002). By using this model to investigate why people make specific decisions about a particular behaviour, it is possible to learn which measure is the most important with respect to the behaviour of interest, and therefore which behaviour should be the target of behaviour change interventions (St John et al., 2010).

2.3 Interventions for behaviour change

Identifying the factors that contribute to a specific behaviour through the use of a theoretical framework can help inform which interventions should be used to elicit a given behaviour change. Interventions for behaviour change fall into three broad categories: information techniques, positive motivational techniques and coercive techniques (Table 2.1).

Table 2.1 Behaviour change techniques (DeYoung, 1993)

Source of change	Behaviour change techniques		
	INFORMATION	**MOTIVATION**	**COERCION**
EXTERNAL	**Declarative knowledge** Presenting facts	**Material incentives** Such as money or prizes	**Material disincentives** Fines or taxes
	Procedural knowledge Learning the process of how to do something	**Social reinforcement** Social recognition or support	**Social pressure** Fear of negative reactions
	Feedback Receiving feedback from the environment		**Legal mandates**
	Modeling Learning through observation of others		
	Prompting Reminders such as slogans		
INTERNAL	**Direct experience** Such as fieldtrips	**Commitment** Signing an agreement	**Sense of duty**
	Personal insight Interpreting personal experience	**Intrinsic satisfaction** Driven by internal rewards	**Feeling of remorse**
	Self-monitored feedback Observing own behaviour	**Sense of competence /confidence**	

Interventions differ on whether the information or motivation is gained from the environment or through direct personal experience. Most studies of conservation behaviour interventions have focussed on external motivations, however internal motivations should also be considered (De Young, 1993). Internal motivations have been found to produce more long-lasting effects that can be generalised to other situations, whereas external motivations are useful as they can produce rapid behaviour change

(Pittman et al., 1982). So, depending on the desired behaviour change, a combination of techniques may need to be used.

2.4 Measuring motivation to volunteer

The use of volunteers in conservation is increasing. This is due in part to the benefit for the volunteers themselves, and also the reduced cost for the conservation organisation (Measham and Barnett, 2008). One of the main objectives of this study is to identify whether respondents would be willing to volunteer to conserve saiga, and their motivations. Measham and Barnett (2008) proposed six motivations for participating in conservation volunteering which are:

- Helping a cause
- Social interaction
- Improving skills
- Learning about the environment
- General desire to care for the environment
- Desire to care for a particular place

In order to evaluate whether a respondent is motivated to volunteer the Contingent Valuation Method (CVM) can be adapted. CVM is an economic, non-market based valuation method used to infer an individual's preference for public goods such as environmental quality (Carson, 2000). Many studies have asked respondents to state their maximum Willingness to Pay (WTP) for specific improvements in the environment, and has been widely used as a measure of behavioural intent (Haab et al., 2013). A study looking at conservation of the saiga used the amount pledged for conservation as a measure of behavioural intention, to evaluate saiga conservation effectiveness. This method was found to be a practical tool for evaluating the effectiveness of projects aimed at promoting positive behavioural intentions towards conservation (Howe et al., 2011). This measure of WTP can be adapted further to and Willingness to Help (WTH) can be used as a measure for behavioural intention, this is useful when working in areas that have low incomes (Samuel, 2011).

2.5 Behaviour change in conservation

Internet searches for publications using the terms “human”, “behaviour” and “conservation” yield very few results (Cowling, 2014). This is surprising as conservation projects often seek to alter human behaviour. Theoretical frameworks for behaviour change have received little attention from conservation scientists, although some of the elements of the frameworks have been considered independently in several conservation studies (St John et al., 2010).

Attitudes are perhaps the most commonly studied dimension, as there has been a general perception that positive attitudes are linked with pro-conservation behaviours (Holmes, 2003). In a review of eleven studies that investigated the influence of attitudes, only four of them used a theoretical framework; three used the TPB, and one used the TRA. Out of the eleven studies, only nine could establish a link between attitude and behaviour, and only four of these were able to progress to the final step of making recommendations for interventions to address conservation behaviours. All of the studies that were able to make recommendations had used a theoretical framework. The reason the other studies were unable to make recommendations was because they focused on general attitudes that did not correspond with the specific behaviour they were seeking to address (St John et al., 2010).

Attitudes about the environment develop at an early age, so it has been proposed that targeting environmental education at children over adults is preferable as it can encourage the development of positive behaviours (Bryant and Hungerford, 1997). Another benefit of targeting children is that it may also influence their parent’s environmental awareness and knowledge. This is known as ‘inter-generational influence’ (Uzzell and , 1994). For example, a study found that parents whose children participated in wetland work, environmental education and discussed their experience, had greater knowledge than parents who did not (Damerell, 2009).

A limitation for many conservation projects is that they are unable to carry out long term evaluation of interventions to observe whether there is any lasting change in behaviour. It

also difficult to separate out which changes are as a result of the intervention, and which are a result of other factors.

2.6 Conservation evaluation

Conservation evaluation has become increasingly important as organisations are increasingly required to demonstrate the impact of interventions. Conservation evaluation can help determine whether a conservation strategy is working effectively and can serve as an early-warning system for potential problems and help identify solutions (Stem et al., 2005). An analysis of 56 reports on conservation education programs between 1975 and 1990 found that fewer than half of the programs were successful in achieving their objectives. However, the programs that included evaluation in the design of the project had significantly higher rates of success (Norris and Jacobson, 1998).

Adaptive management has been suggested as a solution for effective evaluation of conservation. The ultimate goal of adaptive management is to adapt and learn to improve an ongoing project or intervention (Stem et al., 2005). Adaptive management uses both biological and social sciences to support practitioners in their work and integrates the design, management and monitoring of a project. For effective conservation, adaptive management requires defined targets, knowledge about the available interventions and effective indicators of change (Salafsky et al., 2002).

Despite scientific literature reporting the strengths of adaptive management, there are very few examples where this approach has been applied in its entirety to real-world conservation problems (Keith et al., 2011). One of the few examples is in Kruger National Park where the approach is well established. Yet even in a large scale project such as Kruger it has proved difficult to implement active adaptive management (large-scale, replicated trials using different approaches), because of local variation and logistical problems (Van Wilgen and Biggs, 2011).

Despite adaptive management being the preferred method for evaluation, studies have shown that many forms of evaluation, both qualitative and quantitative can help improve

education and awareness interventions (Norris and Jacobson, 1998). Conducting a formative evaluation which assists with immediate modifications of program design and implementation; and a summative evaluation which occurs after a program is completed maximises a program's success (Norris and Jacobson, 1998). So to assess whether a behaviour change intervention is successful ongoing and post-intervention evaluations should take place.

2.7 The saiga antelope

2.7.1 Saiga behaviour and ecology

The saiga antelope (*Saiga tatarica*) is a long distance migratory ungulate that inhabits the steppes and deserts of Russia and Central Asia. The only surviving member of its genus, *S. tatarica* exists in two subspecies; *S. t. mongolica* found only in Mongolia and four populations of *S. t. tatarica*, found in Kazakhstan, Russia and Uzbekistan (Figure 2.4).

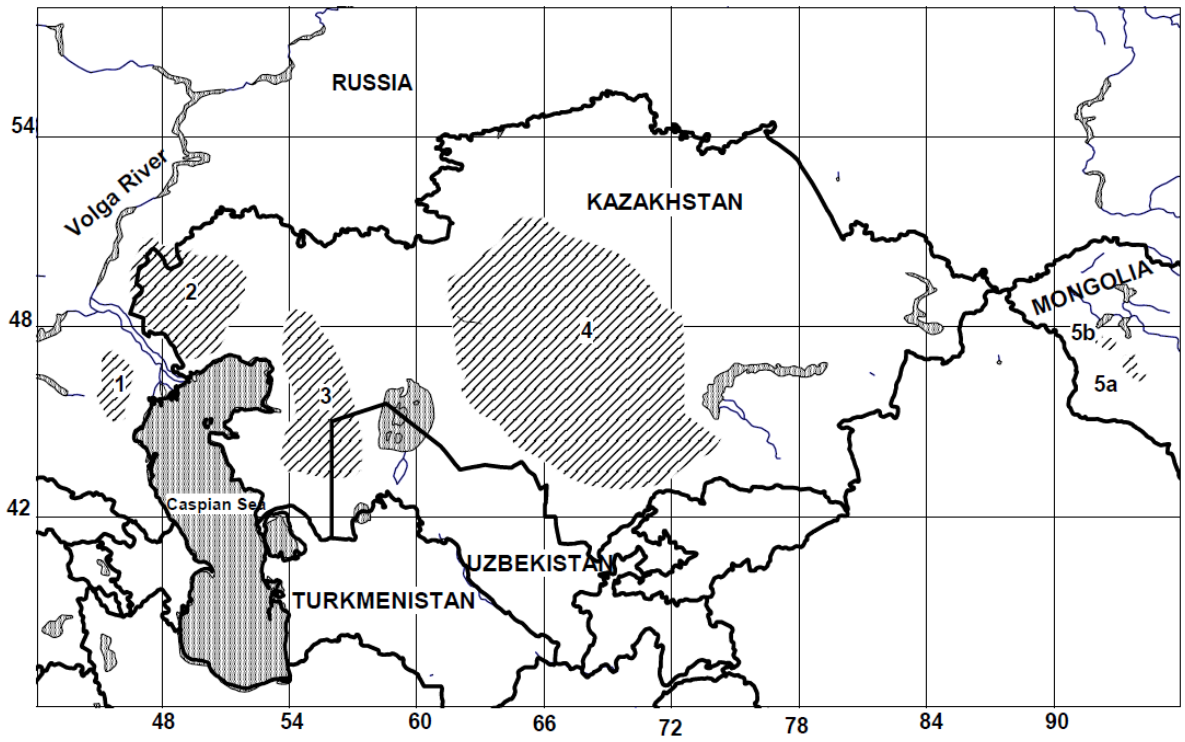


Figure 2.4 Saiga populations distributed in Kazakhstan. 1. Pre-Caspian, 2. Ural, 3. Ustyurt, 4. Betpak-dala, 5. Mongolian (Milner-Gulland et al., 2001).

Female saigas form large aggregations to give birth in spring, during their annual migrations to the summer ranges to reduce the risk of predation (Singh et al., 2010; Milner-Gulland,

2001). Saigas are highly fecund; females mature at 8 months, give birth in their first year and twinning rates can be as high as 64% (Milner-Gulland et al., 2001).

As a keystone species of the Central Asian rangelands, the saiga antelope has an important influence on ecosystem structure. Highly adapted to steppe conditions, it is the only migratory wild ungulate within its range, and until its recent decline, the only wild ungulate found in significant numbers. Its grazing has the potential to maintain floral diversity and conditions required by a range of local taxa, and it also provides an important prey and carrion base for raptors and predators such as the caracal, grey wolf and the jackal (Bekenov et al., 2001).

2.7.2 Historical and current populations

Saigas were formerly abundant; numbers began to decline during the second half of the 19th century as a result of hunting and severe weather conditions. The decline in range and numbers continued into the beginning of the 20th century and by the 1930's were close to extinction. Implementation of protective measures allowed the population to recover rapidly, and by the 1950s, saiga had re-occupied most of their 19th century range (Bekenov et al., 2001). Following the dissolution of the Soviet Union in 1991 there was a further deterioration of the saiga population. The decrease in population was a result of dramatically elevated levels of poaching and the illegal trade of saiga horns and other products such as meat. This increase in uncontrolled hunting of saiga was caused by collapses in the rural economies of former Soviet states and the simultaneous removal of funding for saiga management (Milner-Gulland et al. 2001). With a 95% reduction in population over the last 20 years, the saiga antelope has experienced one of the fastest declines recorded for mammals in recent decades. Once migrating in herds up to 100,000 strong across the plains of Central Asia and Russia, the species is now listed by IUCN as critically endangered.

The outlook for saiga has improved recently; a Memorandum of Understanding under the Convention of Migratory Species (CMS) has led to substantial investment in saiga conservation. Since 2002 the rate of decline has decreased throughout the saiga's range:

four populations were stable or increasing in 2010 (CMS, 2010). Despite these successes saigas face numerous problems. Small population sizes leave saigas vulnerable to stochastic events such as extreme weather conditions or diseases, which have caused large mortality events in the past (Kock et al., 2011; Robinson & Milner-Gulland, 2003).

2.7.3 Cultural importance

Saigas used to play an integral role in the social and cultural life of local communities; the species has substantial potential for generating significant levels of revenue and food, and is a source of pride and spiritual fulfilment to many (Kuhl, 2008).

The saiga antelope is celebrated in Kazakh culture and is seen as a flagship species of the steppe. Saigas appear in anything from ancient fairy tales to statues found in town square fountains. Its image is printed on the 2,000 tenge local currency and is an essential symbol of Kazakhstan's ancient nomadic past.

Alongside the importance of saiga, hunting is also an economically and culturally important activity. In economically-deprived regions, the illegal hunting of saigas and the sale and export to Asia of their horns often serves as an important source of income, as does the sale of saiga meat for local consumption (Phillipson and Milner-Gulland, 2011).

Acknowledging the the cultural and economic importance of saigas and hunting is vital in the design of any conservation intervention.

2.7.4 Kazakhstan and it's people

Kazakhstan is the ninth largest country in the world and has had the fastest growing economy of all the ex-Soviet states since the mid-1990s. The World Bank (2013), places Kazakh gross national income at $11,380 per person per annum. Over the last three years the share of people living in poverty has reduced from 5.5% in 2011 to 2.9% in 2013. Although poverty has decreased across Kazakhstan as a whole, there is considerable cross-regional variation, and in some regions economic growth provides few benefits to the poor (Mussrov, 2012). Kazakhstan has a population of 15,753,460 with 46% living in rural

settings. The ethnic Kazakhs represent 63.1% of the population and ethnic Russians 23.7 (UN, 2014).

This study takes place in the oblast (region) of West Kazakhstan. The oblast borders Russia and is near the Ural Mountains with the Ural River flowing from Russia to the Caspian Sea through the region. West Kazakhstan has a population of 200,000 and the capital is Uralsk. About 57% of the population is rural, with agriculture being the main industry in rural areas. Poverty is higher in regions where agriculture is the main livelihood (Mussrov, 2012).

2.7.5 The Ural saiga population

The rangelands of Kazakhstan are characterised by low rainfall, severe winters (average January temp: -14°C, min: - 40°C) and hot summers (max: 50°C). The western part of Kazakhstan is dominated by steppes in the north and deserts towards the south Snow cover is more prolonged and deeper in the northern steppe than in the southern deserts, which is hypothesized to drive the migratory behaviour of the saiga in addition to spatial and temporal variation in vegetation cover (Robinson & Milner-Gulland, 2003). Levels of infrastructure and human population density are relatively low throughout rural West Kazakhstan, permitting the extensive migrations of saiga antelope populations.

The Ural saiga population fell from 236,000 in 1991 to 26,400 in 2013 (SCA, 2013). In 2005 saiga hunting was prohibited in Kazakhstan. In 2010, nearly 12,000 saigas from the Ural population were found dead over the course of a week. The dead were mostly females who had recently given birth, which suggest that their calves also died. There have been subsequent mass die-off events in the Ural population in 2011 and Betpak Dala population in 2012. The saiga is naturally prone to mass mortality caused by disease or harsh weather. This did not cause a problem for the saiga population in the past as they were abundant, but this is no longer the case (SCA, 2012).

2.7.6 Saiga conservation in Ural to date

The Saiga Conservation Alliance (SCA) is an international network of researchers and conservationists who work across saiga range states on projects to conserve the saiga

antelope. In Kazakhstan the SCA work in collaboration with Association for the Conservation of Biodiversity in Kazakhstan (ACBK). The SCA provides international experience and expertise, coordinates the project and liaises with the donor. ACBK provides in-country expertise and contacts and implements the project on the ground.

Prior to the mass mortality event in 2010, there had been no public engagement interventions in the Ural region. The CMS (2010) listed public engagement as a top priority in its medium term work programme for the saiga in Kazakhstan. As a result of this a project was designed to increase public knowledge of saiga conservation issues, to increase public exposure to saigas, and to increase public emotional engagement, active participation and collaboration, in order to achieve more supportive, positive attitudes and increased pro-saiga behavioural intentions in the community (SCA, 2012).

The public engagement events were carried out in collaboration between the SCA and ACBK. The campaign included the establishment of annual Saiga Days (SD), a six months participatory monitoring programme, the development of a 'Saiga Friends' network, as well as additional meetings and the distribution of literature to share information with seven villages in West Kazakhstan (Figure 2.5)

Figure 2.5 Map of target villages for public engagement events (SCA, 2012)

The effectiveness of the awareness and participatory monitoring campaigns underwent an evaluation in 2011. The evaluation indicated an increase in knowledge of saiga conservation issues, and an increase in positive attitudes and behavioural intentions towards saigas in local people. There was also evidence that people cared more about saigas post-campaign and that they were more willing to help in saiga conservation efforts, either by contributing financially or by giving up time to help saiga conservation. Pre-campaign, only 59% of people were prepared to give up time to help saigas, while afterwards 91% were. The majority of children that attended SD had a positive experience and felt they had a higher level of knowledge than previously (Samuel, 2011).

The evaluation of the participatory monitoring scheme showed that all of the participants monitored effectively and consistently, and their results were consistent with other survey methods. 17 of the 20 participants were very enthusiastic about their experience on the scheme and wanted to continue (Chilton, 2011).

In 2012 Steppe Wildlife Clubs (SWC) were established with the assistance of the SCA. In the Ural region they were set up in the villages of Akkol, Azhibay and Nursai with the help of local teachers. Teachers attended seminars on the principles of ecological education to ensure there was consistency between the groups. The SWC aim foster an interest in the environment in the younger generation by involving them in practical conservation activities, by helping them acquire independent research skills, by developing communication and leadership skills, as well as laying the groundwork for their future professions. It is hoped that these activities will help young people to participate in combatting saiga poaching, as it seems that teenagers, especially boys, are increasingly engaged in illegal saiga hunting. It is also important to consider the possibility of children's influence on adults. There have been examples of children refusing to eat saiga meat on moral grounds, which then reduced their mother’s motivation to buy saiga meat (Shivaldova, 2013).

3 METHODS

3.1 Methodological framework

This study used the TPB (Ajzen, 1991) as a framework to assess willingness to volunteer in saiga conservation by measuring the standard variables of the TPB, which includes attitude towards the act, social norms, perceived behavioural control, and behavioural intention (Figure 3.1).

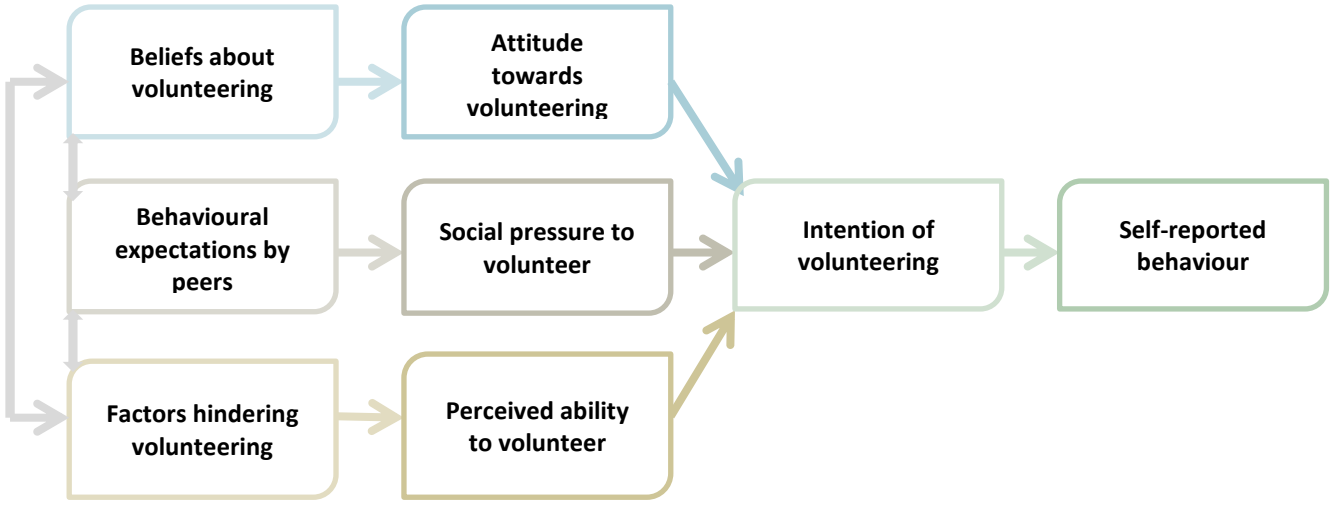


Figure 3.1 Ajzen's (1991) Theory of Planned Behaviour adapted for this study

In addition, the variables of knowledge and general attitudes towards the steppe environment included, as these have been recognised as important in influencing pro-environmental behaviour (Gifford and Nillson, 2014). Researchers have argued for including measures of knowledge concerning desired environmental behaviour, reasoning that the more people know about their environment, the more appropriately they will behave (Grob, 1995).

3.2 Study design

The study was conducted in two villages in West Kazakhstan – Azhibay and Nursai. The villages were chosen as they have both had SD and SWC operating in them for the same period of time. SD's have occurred in 2010, 2013 and 2014 and SWC have been running since 2013.

A questionnaire was chosen as the most appropriate method as it has been shown to produce robust findings regarding the relationship between behaviour-specific norms, intentions, attitudes, beliefs and self-reported behaviours (Vinning and Ebreo, 2002).

A minimum sample size of 80 is required for the analysis of TPB (Francis et al., 2004). The SD quiz was distributed to all attendees of the SD event.

3.2.1 Questionnaire design and pilot

The questionnaire (Appendix I) contained four main sections: socio-demographic information; knowledge of the steppe; attitude towards the steppe; and willingness to volunteer using the TPB.

3.2.2 Knowledge section

The knowledge section was adapted and extended from questions previously asked to school children in the Ustyurt saiga range (Damerell et al., 2011). The SCA were also consulted to ascertain what topics had been covered by the SWC in the previous year to ensure questions were set at an appropriate level. Participants were asked about steppe ecology and conservation to generate a knowledge score. Knowledge scores were calculated by giving one point for every correct answer, with a total maximum score of sixteen.

3.2.3 Attitude section

Attitudinal questions were replicated from previous research carried out in the Ustyurt saiga range (Phillipson and Milner-Gulland, 2011). Attitude questions were formulated either negatively or positively and scored from -2, strongly negative towards saiga, to +2 for highly positive responses. Summing responses to the seven attitudinal questions formed individual attitude scores.

The attitude section also included questions on WTH in which respondents agreed with the statement “I would personally be prepared to act on a volunteer basis to conserve saiga”. The response was rated on a scale from -2 for strongly disagree to +2 for strongly agree.

Respondent's that answered positively to this question were then asked to indicate from a list which type of volunteer activities they would be willing to do.

The questionnaire also included sections on perceived threats to siagas and asked to rank the interventions they thought would be most effective in improving the saiga population.

3.2.4 TPB section

The TPB section contained items specifically tailored to assess attitudes, subjective norms, perceived behavioural control, intentions, behavioural beliefs, normative beliefs and control beliefs. The section was designed using guidance for constructing a TPB questionnaire by Icek Ajzen (2002). For all of these items the target behaviour was whether the respondent was willing to volunteer to conserve saigas.

Behaviour: Two items with five-point scales, indicating how often they talk about or volunteer to conserve saiga, ranging from never to daily. This measure relies solely on self-reported behaviour and does not include any direct observation. However, self-reported behaviour has been shown to be closely linked to beliefs and social norms (Corral-Verdugo, 1997). Also, previous studies employing the TPB have argued that future behaviour is influenced by habit and repetition of past behaviours (Boldero, 1995)

Intention: One item with a five-point scale, ranging from *definitely not* to *definitely*, was used to assess how likely the respondent was to engage in saiga conservation in the future.

Attitudes: Attitudes towards saiga conservation were assessed by one item asking whether participating in saiga conservation is a beneficial activity , measures on a five-point scale ranging from *strongly disagree* to *strongly agree*.

Subjective norms: Two items with five-point scales were used to measure subjective norms, ranging from *strongly disagree* to *strongly agree*. The questions required respondents to assess whether their friends and family though saiga conservation is important and whether they would approve of the respondents involvement.

Perceived behavioural control: Three items in total for direct and indirect measures, with five-point scales ranging from *strongly disagree* to *strongly agree*. These items covered having the time, resources and support to engage in conservation.

Behavioural beliefs: Two items, with five-point scales ranging from *strongly disagree* to *strongly agree*. These items assessed whether the respondent felt engaging in conservation is important to them.

Normative beliefs: Two items, with five point scales ranging from *strongly disagree* to *strongly agree*. Respondents were asked to indicate how much their friends and family would influence their engagement in conservation.

Control beliefs: Two items, with five-point scale, ranging from *strongly disagree* to *strongly agree*. These assessed whether respondents would require financial incentives or more knowledge to enable them to become involved in conservation.

3.2.5 Saiga Day Quiz

A shortened version of this questionnaire was developed to administer to both children (Appendix II) and adults (Appendix II) at SD. The shortened version includes the first three sections of the main questionnaire, and excludes the section on TPB. The adapted versions, termed 'Saiga Day Quiz', were developed to help assess the impact of awareness events on knowledge, attitudes and WTH. They did not include the TPB section as they were designed to be self-administered during the event.

3.3 Pilot

As a pre-test for comprehension and length of the questionnaire supervisors, fellow students and in-country partners of the SCA reviewed the document. As a result of this, several TPB measures were reduced to single or double items. The SD quiz for children was also amended, so that only children 14 or over would complete the attitude section, as it was deemed the items were too complex for children of primary school age.

The questionnaire and SD quiz were translated into Russian and Kazakh before being reviewed by the local research assistants to check for understanding. The SD quiz was piloted at a SD in Kalmykia by another student. Suggestions were made about how to best administer the quizzes and were subsequently implemented in the SD quiz procedure outlined below. The questionnaire was piloted on ten people in the village of Azhibay on the first day of research. All research assistants then reported back to the team and no changes were required.

3.4 Questionnaire procedure

Interviews were conducted between 4th and 7th May in Azhibay and between 10th and 13th May in Nursai. The research team consisted of five Kazakh/Russian speakers and one Russian speaker. The research teams split into three pairs and would conduct the questionnaire in the preferred language of the participant. In both of the villages there were no street signs and the houses were unnumbered so opportunistic sampling was conducted as a systematic sampling strategy was not possible. To reduce sampling bias the interviews were conducted on week days and weekends and at various times of day. Each interview lasted approximately 40 minutes. By the end of the research period the entire area of each village had been covered.

3.5 Saiga Day quiz procedure

The purpose of the SD quiz was explained to the head teacher of each school. To facilitate the distribution of the quiz, the head teacher arranged for them to be circulated to each class and staff member attending SD. Everyone was informed that there would be a prize draw for all completed quizzes in order to encourage participation. Distributing quizzes to class groups also ensured that younger children could ask for help if they did not understand any of the sections. Once completed, quizzes were then placed in prominently displayed boxes in preparation for the prize draw. Small prizes of sweets, English souvenirs, and the main prize of toy saigas were awarded.

3.6 Statistical analysis

All Statistical analysis was carried out in R 3.0.1 and Microsoft Excel was used for data management. Upon completion of data collection the scores for knowledge, attitude, WTH and TPB components were standardised. The distribution of each variable was checked which highlighted that the responses in employment status and TPB components were stacked heavily in certain brackets. As a result the employment status of "Other" was removed and the TPB responses were grouped into three brackets of negative, neutral and positive scores.

Pearson's r was employed to check for a relationship between the three dependent variables of knowledge, attitude and WTH. A series of t tests and ANOVAs were conducted to examine associations between attitude, knowledge and WTH scores and potential explanatory variables. At this stage the explanatory variables of gender and age were excluded as the employment status covered both of these through the categories of student, pensioner and homemaker.

The probability of agreement above chance between the respondents was measured using the Kappa Statistic. Kappa is used predominantly in clinical fields to quantify the levels of consistency with medical diagnoses. There are various forms of the statistic; for this study Fleiss' Kappa (1981) has been applied as it allows for comparison between more than two raters on a multi-category scale. Fleiss' Kappa co-efficient (1981) was calculated for responses to Attitude, Interventions and TPB to check for inter-rater agreement. Landis and Koch's (1977) guide for strength of agreement for Kappa was used as an indicative guide (Table 3.1).

Table 3.1 Landis and Koch's (1977) Interpretive Guide to Kappa Agreement

	Poor	Slight	Fair	Moderate	Substantial	Almost Perfect
Kappa	0.0	.20	.40	.60	.80	1.0

Kappa	Agreement
<0	Less than chance agreement
0.01 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.61 -0.80	Substantial agreement
0.81 – 0.99	Almost perfect agreement

3.6.1 Knowledge, Attitude and WTH analysis

A series of General Linear Models (GLM) were used with Knowledge, Attitude or WTH as the dependent variable, they included responses from all participants who had completed these sections in either the questionnaire or SD quiz. These models were then repeated for children only and the explanatory variable of SWC membership was added. A step-wise regression was employed to find the models with the best fit.

3.6.2 TPB Components

The process for analysing TPB followed the procedure as set out by Francis *et al.* (2004). The TPB components were tested for internal consistency by completing a series of bivariate correlations between direct and indirect measures. Analysis was first conducted on the direct measures. Using a multiple regression procedure, intention was the dependent variable, and the direct measures of attitude, subjective norm and perceived behavioural control were the predictor variables along with Employment Status and Village. Analysis was then conducted in the same way on the indirect measures of behavioural beliefs, normative beliefs and control beliefs using the direct measures as the independent variable.

3.7 Ethics

To protect data and safeguard the anonymity and confidentiality of respondents an ethics assessment was conducted prior to the commencement of field work. All participants were informed at the beginning of the questionnaire how their information will be used and who it will be shared with. The survey only continued with the participant's consent. Information that could directly identify the subject such as name and date of birth was not recorded. Instead, the participant was assigned an ID number. Hard copies of the questionnaires were collated at the end of each day stored safely in a document bag. The document bag was stored in a locked bag, room or vehicle when not in use. Electronic data is stored on a password protected laptop and encrypted memory stick. The laptop and memory stick were stored in separate bags and kept on my person whenever possible.

4 RESULTS

There were 239 respondents in total, with varying numbers of responses for each section of the questionnaire (Table 4.1).

Table 4.1 Number of respondents for each section of the questionnaire

	Knowledge *n*	Attitudes *n*	TPB *n*
Full Questionnaire	113	113	113
SD Quiz - Adults	34	34	0
SD Quiz - Children	92	55	0
Total	**239**	**202**	**113**

The results are presented in the order of the questionnaire, with an additional section that looks specifically at the children's responses in order to investigate the impact of SWC membership. Details of the maximum and minimum models can be found in Appendix IV and V.

4.1 Determinants of knowledge

Overall, respondents had a very high level of knowledge with the mean score being 12 out of 16 (75%). Nearly all of the respondents knew that saiga lived in Kazakhstan (n=238). However very few knew that the saiga range extended to Uzbekistan (n=81). Most (n=200) knew that it is always illegal to hunt saiga. The variables that impacted knowledge scores significantly are employments status and village (Table 4.2).

Table 4.2 Summary of GLM for knowledge section of questionnaire

	Employment status	Village	SD attendance	Interactions
Knowledge of the steppe	+ P - H	- N		

Legend: H: Homemaker N: Nursai P: Pensioner Statistical significance: + / - 0.01 – 0.05

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Homemakers have significantly lower knowledge scores than other groups (GLM, t = -2.435, df 232, p = .015) and pensioners had significantly higher levels of knowledge (GLM, t = 2.118, df = 232, p =.035) (Figure 4.1). Residents of the village Nursai were found to have significantly lower knowledge scores (GLM, t = 1.123, df = 232, p= .035) as shown in Figure 4.2.

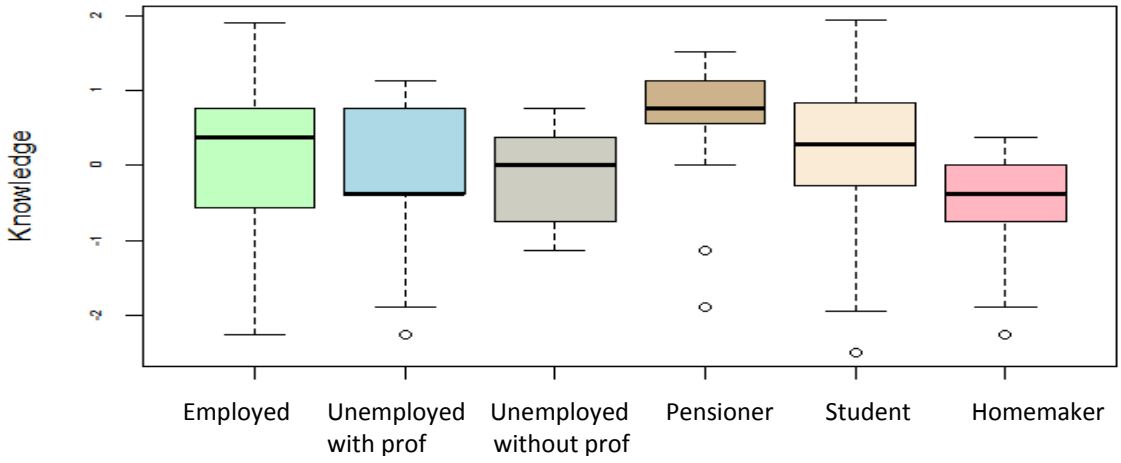


Figure 4.1 Difference between knowledge scores of employment status categories

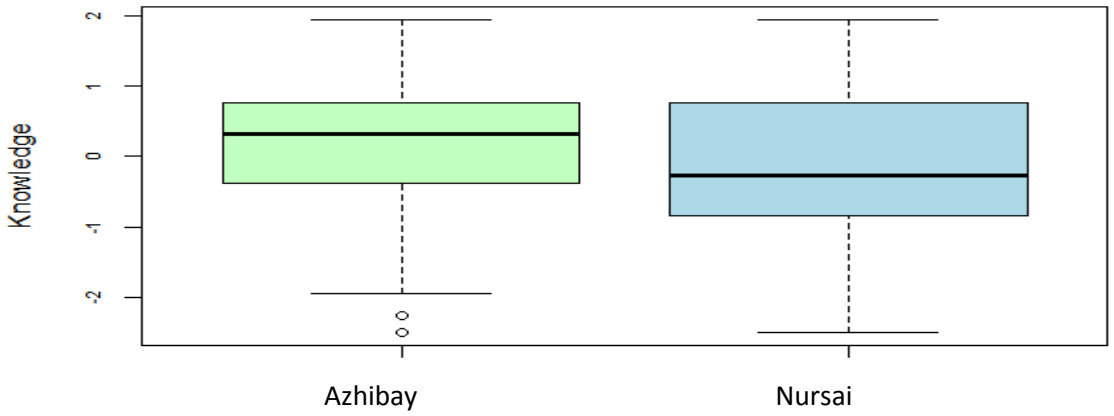


Figure 4.2 Difference between knowledge scores of two villages

4.2 Perceived threats and interventions

239 Respondents were asked to identify what they consider the greatest threat to saiga in their region (Table 4.3).

Table 4.3 Perceived threats to saiga population

Threats	Responses *n*
Hunting by people	169
Extreme weather	33
Predation (e.g. by wolves)	16
Other	11
Lack of grass	7
Development and infrastructure	3

The majority of respondents perceived hunting as the main threat to the saiga population. No significant relationship was seen between participants choice of threat and SD attendance (Chi squared = 7.5582, df = 4, p = 0.109). This finding is similar to previous study looking at the impact of educational activities on children's perceptions of threats (Damerell et al. 2011).

With regards to potential solutions to the threats, respondents ranked which three interventions they considered to be most important for improving the status of the saiga (Table 4.4).

Table 4.4 Ranked responses for most effective interventions to improve the status of saigas

Intervention	Ranked *n*:	First	Second	Third	Total
Increase penalties for people who are caught		55	60	36	**151**
Increase direct public involvement in saiga conservation		17	39	61	**117**
Increase law enforcement effort		39	42	32	**113**
Improving incomes of local people from their current jobs		48	15	17	**80**
Change people's views on the value and importance of saigas		20	24	36	**80**
Help local people to get different jobs		21	25	14	**60**

The order in which different respondents ranked the suggested interventions was not particularly consistent between respondents (Kappa statistic = 0.126, slight agreement) (Table 4.5). Each of the individual ranks also had a rating of slight. This shows that there is some agreement between respondents about which are the top three most important interventions. This is in line with previous research in the Ustyurt region in which respondents from Kazakhstan rated increasing penalties as the most important intervention for reducing poaching (Phillipson and Milner-Gulland, 2011).

Table 4.5 Kappa statistic of agreement for interventions

	Kappa Statistic	
Overall ranks	0.126	Slight
First	0.108	Slight
Second	0.052	Slight
Third	0.070	Slight
No rank	0.207	Slight

4.3 Determinants of attitudes

Attitudes towards the conservation of the steppe environment are overwhelmingly positive with only 22 out of the 202 respondents who completed the attitude section holding negative views. Respondents are particularly favourable towards saiga as 178 people disagreed with the statement "If there were no more saiga in this country I would not mind".

The Kappa agreement between the respondents to the attitude section was 0.196, or "Slight" (Landis and Koch, 1977). All of the Kappa results can be seen in Table 4.6. The response 'strongly disagree' to the attitude questions had the highest agreement of 0.314, or "Fair". This could be because that those who held negative views are more likely to have a general negative attitude towards conservation as a whole.

Table 4.6 Kappa statistic of agreement for attitudes

	Kappa Statistic
Overall response	0.196 Slight
Strongly disagree	0.314 Fair
Disagree	0.007 Poor
Neutral	0.040 Slight
Agree	0.202 Slight
Strongly Agree	0.067 Slight

Variables found to have a significant impact on attitudes towards the conservation of the steppe include village (GLM, t = 2.282, df = 165, p = .023) and levels of knowledge (GLM, t = 2.355, df = 165, p = .019) as shown in (Table 4.7).

Table 4.7 Summary of GLM for attitude section of questionnaire

	Knowledge	Employment status	Village	SD attendance	Interactions
Attitude	+		- N		

Legend: N: Nursai Statistical significance: + / - 0.01 – 0.05

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The residents of the village Nursai have better attitudes towards the conservation of the steppe than the residents of Azhibay (Figure 4.3). Overall, those with higher levels of knowledge have more positive attitudes toward conservation of the steppe. So the fact the

residents of Nursai have more encouraging attitudes despite having lower knowledge scores than the residents of Azhibay may mean that other factors are important in the development of positive attitudes.

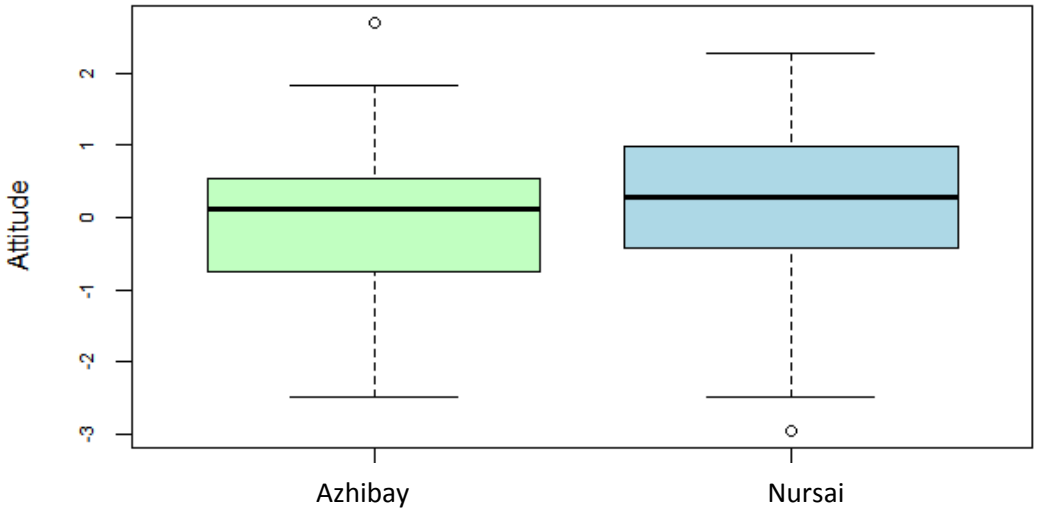


Figure 4.3 Difference between the attitude scores of two villages

4.4 Extent of willingness to help

160 (79%), of the 202 respondents to the WTH section, answered positively to the question "I would personally be prepared to act on a volunteer basis to conserve saiga antelope". The most popular activity, cited by 59% of respondents, was participating in saiga awareness events (Table 4.8).

Table 4.8 Volunteer activities respondents would be prepared to do

Volunteer activity	Children responses		Adult responses		Total Responses	
	n	*%*	*n*	*%*	*n*	*%*
Participate in more saiga awareness events	34	(62%)	85	(57%)	119	(59%)
Talk about the importance of saiga conservation to family / friends	10	(18%)	71	(48%)	81	(40%)
Help with collecting ecological data on saiga populations	35	(63%)	23	(15%)	58	(28%)
Lead / organise awareness events or clubs	29	(52%)	24	(16%)	53	(26%)
Donate money	19	(18%)	10	(7%)	29	(14%)

The same WTH and volunteer activities were also asked to residents in the Ustyurt saiga range (Phillipson and Milner-Gulland, 2011). They also found that 79% of respondents would be willing to help conserve saigas. However, only 9.6% of respondents in the Kazakhstan part of the Ustyurt region were willing to participate in saiga-related events compared to 53% in this study. The reasons for these differences would need to be explored further, as SD attendance was not found to be a significant variable in determining WTH. This is different to a previous study in Ural, which found WTH increase from 59% to 91% after an intensive education and awareness campaign (Samuel, 2010).

It is interesting to compare the difference in responses between adults and children. Children are much more likely to volunteer to collect ecological data or lead events. Adults are much more likely to talk about the importance of saiga conservation to friends and family.

Variables that were found to be significant determinants of WTH are knowledge (GLM, t = 3.277, df = 155, p= .001) and occupation as shown in Table 4.9.

Table 4.9 Summary of GLM for willingness to help section of questionnaire

	Knowledge	Attitude	Employment status	Village	SD attendance	Interactions
WTH	+ +		- - P			- - K:S - - K:H

Legend: H: Homemaker K: Knowledge P: Pensioner S: Student

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

There is a positive relationship between knowledge and WTH, the higher a respondents' knowledge score the more likely they are to volunteer. Despite having higher knowledge scores, pensioners are less likely to volunteer to help (GLM, t = -3.305, df = 155, p = 0.001). This may be due to other factors that need further exploration such as age and health. There is also a negative interaction between knowledge scores and employment status for students (GLM, t = -3.229, df = 155, p = 0.001) and homemakers (GLM, t = -2.106, p = 0.036) in relationship to WTH. This means that knowledge is less of a driver of WTH for students and homemakers.

4.5 Determinants of behavioural intention

Intention to volunteer can be predicted by all components of TPB except for PBC (Table 4.10). There was no correlation between control belief and PBC (r = -0.05, df = 111, p-value = 0.5446). A low correlation implies the indirect measures was poorly constructed or does not adequately cover the breadth of the measured construct.

The most important variables in the prediction of volunteering to conserve saigas are the attitude towards the behaviour and subjective norm (Figure 4.4).

Table 4.10 Summary of GLM for Theory of Planned Behaviour components

	Intention	Attitude	Subjective norm	PBC	Behavioural beliefs	Normative beliefs	Control Beliefs	Employment status	Village	Interactions
Self-reported behaviour	+									
Intention		+ +	+ + +					- U - P		
Attitude					.					
Subjective Norm						+		- - UW	- N	+ + UW:N
Perceived Behavioural Control										

Legend: Variable not included in model

N: Nursai P: Pensioner U: Unemployed without profession UW: Unemployed with profession

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

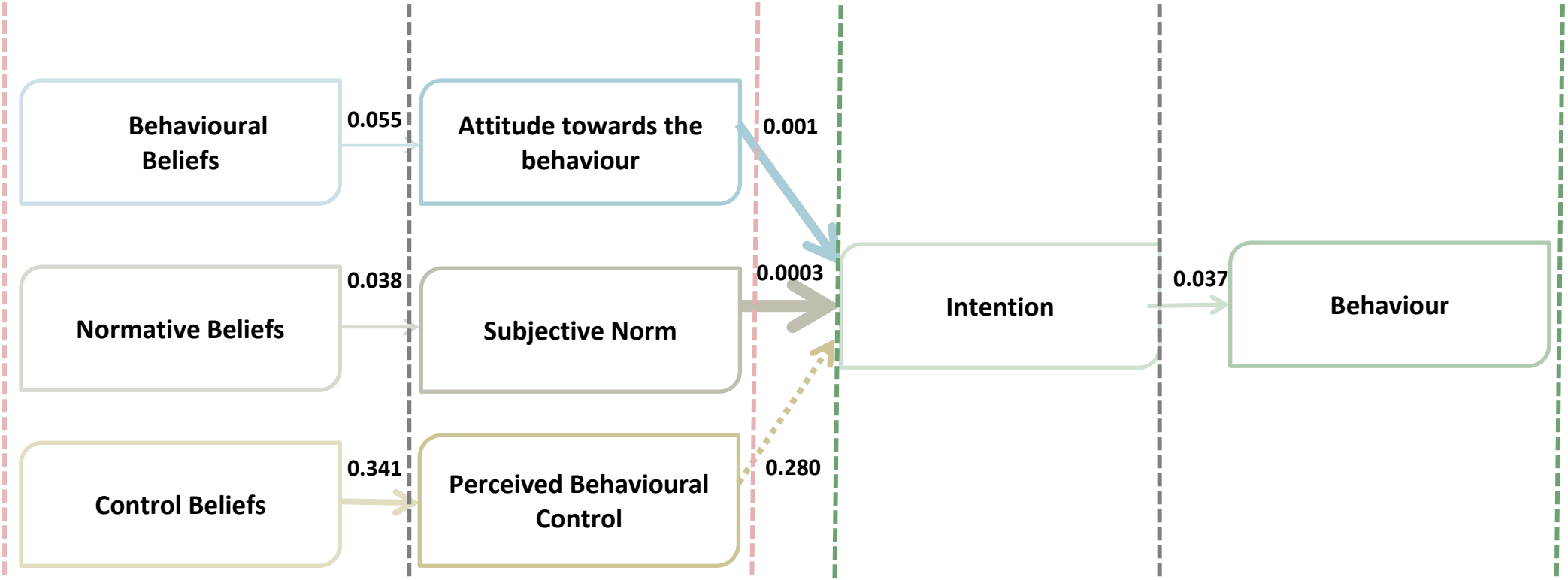


Figure 4.4 Theory of planned behaviour with significance of each component

In addition the model shows a significant positive relationship between intention and behaviour, although in this case the behaviour is only self-reported and not observed directly. The addition of the variables employment status and village were significant in relation to certain TPB components. Respondents who are unemployed without a profession ($p = .015$) or a pensioner ($p = .042$) have lower intention to engage in saiga conservation. There is a positive interaction between subjective norm and respondents from the village Nursai ($p = .009$) and who are unemployed with a profession ($p = .003$). This means that being unemployed is more of a driver of subjective norm for respondents from Nursai.

The Kappa agreement between the respondents to the TPB section was 0.325, or "Fair" (Landis and Koch, 1977) (Table 4.11). The response 'disagree' to the TPB items had the highest agreement of 0.496, or "Moderate". This could be because that those who hold negative views are more likely to have a general negative attitude towards volunteering as a whole.

Table 4.11 Kappa statistic of agreement for Theory of Planned Behaviour components

	Kappa Statistic	
Overall response	0.325	Fair
Strongly disagree	0.370	Fair
Disagree	0.496	Moderate
Neutral	0.089	Slight
Agree	0.405	Fair
Strongly Agree	0.098	Poor

4.6 Influence of Steppe Wildlife Club membership

92 children completed the knowledge section of the SD quiz, 24 of whom are members of the SWC. The knowledge scores of non-members is significantly lower than members (GLM, $t = -4.151$, $df = 90$, $p = 0.025$) (Figure 4.5). Other explanatory variable such as village or gender were not found to be significant, so this could indicate that SWC membership leads to better knowledge of the steppe. Alternatively it could mean that SWC members have higher levels of knowledge to begin with due to an interest in the steppe, which is why they joined the club.

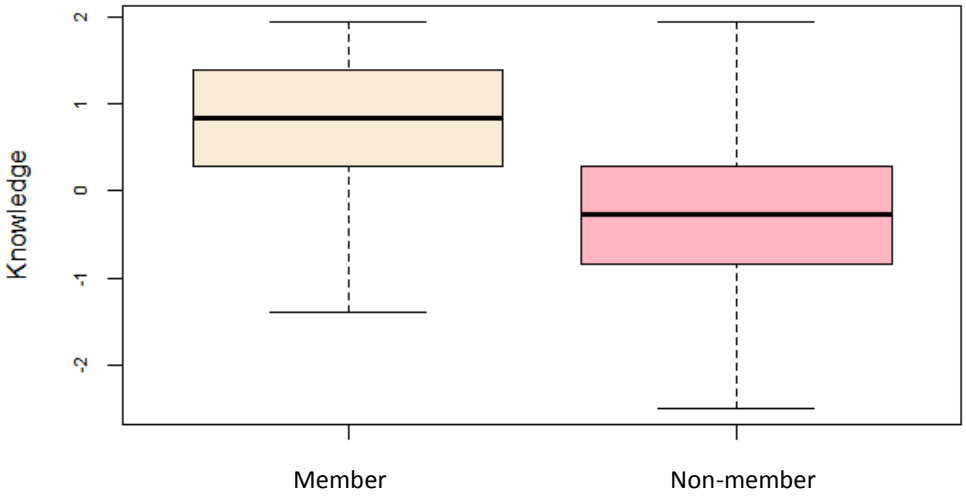


Figure 4.5 Difference between knowledge scores and SWC membership

55 children completed the attitude and WTH section of the SD quiz, 14 of whom are members of the SWC. SWC membership was not found to be an important factor in attitudes towards the conservation of the steppe. SWC membership is only significant as part of an interaction with knowledge and attitude in WTH (Table 4.12).

Table 4.12 Summary of GLM for influence of SWC membership

	Knowledge	Attitude	SWC Membership	Village	Gender	Interactions
Knowledge			- - - NM			
Attitude	+					
WTH						- K:NM ++ A:NM + K:GM

Legend: Variable not included in model

A: Attitude GM: Male K: Knowledge NM: Non-member

Statistical significance: +++ / --- 0 -0.001 + + / - - 0.001 – 0.01 + / - 0.01 – 0.05

5 DISCUSSION

5.1 Knowledge and attitudes towards saiga conservation

Overall, respondents generally had high levels of knowledge about saigas and the steppe. In general, those that had higher knowledge scores were more willing to help, so education is an important factor in encouraging people to engage in pro-conservation behaviour. However, although education is important, research has shown that knowledge alone will not change behaviour (Vining and Ebereo, 2002). For education to achieve maximum impact the type of information provided should be directly relevant to the desired outcome of the project (DeYoung, 1989). Currently, the information shared at SD and in SWC is focussed on the ecology of the steppe and general conservation issues. To have more effect on the behaviour of attendees the information provided should be more specific to the local community and identify actions people can undertake to help with the conservation of saiga.

Residents of Nursai had lower knowledge levels than residents of Azhibay. It is difficult to account for this difference in knowledge scores. SD attendance was not found to have an effect on knowledge levels, so it cannot be attributed to how the public engagement activities are delivered in each village. Although, earlier research on saiga awareness campaigns found that people exposed to them had increased levels of knowledge (Damerell et al., 2011). A possible explanation for this difference could be due to a transfer of knowledge between attendees and non-attendees, as SD's have now been operating in these villages for three years (Damerell, 2009). However, this would require further research. Howe et al. (2011) found that differences in knowledge were explained by socio-cultural factors such as length of residence in village and through communication with older residents. So, potentially the higher levels of knowledge that pensioners and Azhibay residents display could be utilised to generate conservation knowledge in the wider community.

Homemakers had lower levels of knowledge than other groups. The homemakers group is made exclusively of women, who had only attained an education up to secondary level, and did not attend SD. In contrast, women who were employed were generally educated to

degree level and participated in the study due to their attendance at SD in their role as teachers. Previous studies have demonstrated that men tend to have higher levels of knowledge than women (Samuel, 2010). With this in mind it may be useful to investigate gender as an explanatory variable, and explore ways to encourage homemakers to become more involved in engagement and awareness interventions, as it has been shown in previous studies that women are less likely to join environmental groups despite having more positive attitudes (Ozanne et al., 1999).

As mentioned earlier, pensioners have higher levels of knowledge than other groups. This is different to earlier research in the Ural region which suggested that those aged 41-60 had the highest levels of knowledge pre awareness campaign and 16-30 post campaign (Samuel, 2011). Despite having higher levels of knowledge, pensioners were less WTH. This could be due to the fact older members of society are used to the old Soviet style of conservation, which relied heavily on enforcement rather than on voluntary action (Waylen et al., 2012). Research exploring the differences between volunteering in Western and Eastern European countries found that post-communist countries had lower levels of volunteering. To improve volunteering in post-communist countries the study recommended the main focus should be on young, educated people (such as university or high school students), living in medium-size towns. The study suggested they can be attracted to volunteer work by internship activities which can show them the advantages and the rewards of volunteering (Voicu and Voicu, 2009). So, SWC could be a good foundation for fostering volunteering behaviour in the younger generation.

In countries with established volunteering cultures, research has shown that whilst volunteering occurs at all ages and throughout society, certain life stages in particular are associated with increased volunteering. The highest rate of volunteering occurs during middle age (Churchman, 1987). These findings are supported by Australian ABS data which show that highest rate of volunteering was for the age range 35-44 years (40%) (Measham and Barnett, 2008). So this demonstrates that if the young people of the Ural region are introduced to volunteering it will continue into later life and increase as time goes on.

Overall respondents generally had positive attitudes towards the conservation of the steppe, those with higher levels of knowledge and residents of Nursai had more positive attitudes. SD attendance did not have an effect on attitudes towards the conservation of the steppe. This was also found to be the case in a previous study in the Ustyurt region, which attributed the lack of difference to the fact that as attitudes were consistently positive, attending SD could only register a minimal difference in attitudes (Damerell et al., 2011). The existence of such positive attitudes is beneficial for any future conservation interventions in the area, as positive attitudes have been shown to assist in the successful implementation of community-based conservation interventions (Inamdar et al., 1999).

There was no relationship found between having a positive attitude and a respondent's WTH. This is consistent with previous research that has focussed on the relationship between pro-environmental attitudes and behaviour, in which environmental concern has only been found to be weakly related to the performance of pro-environmental behaviours (Vining and Ebereo, 2002). Psychologists suggest that the lack of correspondence between attitudes and behaviour can be attributed to both theoretical and methodological issues. Fishbein and Ajzen (1975) argued that measures of attitude and behaviour should be specific, and that it cannot be expected that general attitudes would be strongly related to individual behaviours. This view has been supported by recycling research that found specific recycling attitudes have consistent relationship with recycling behaviour (Schultz et al., 1995). This is why this study did not just measure general attitudes to conservation of the steppe, but included a TPB section to measure specific attitudes towards volunteering to conserve saiga.

SWC members were found to have higher levels of knowledge than non-members. This was to be expected as part of the knowledge section was based upon the curriculum of the SWC. This may also account for why, despite having higher levels of knowledge, SWC members were not more willing to help as the quiz was biased in their favour. SWC membership was also found not to be significant in relation to attitude. An explanation for this could be related to the type of teaching methods used in SWC. Previous research shows that positive attitudes and behaviours are influenced by direct teaching methods such as fieldtrips and experiential learning, whereas knowledge is influenced by indirect methods such as

classroom based learning through things such as text books (Duerden and Witt, 2010). This suggests that a variety of teaching methods and activities should be incorporated into the SWC.

5.2 Factors that influence participation in saiga conservation

Intention to volunteer was associated with all direct measures with the TPB framework except perceived behavioural control (PBC). The most influential variables are attitude and subjective norm, so should be focussed on in the development on any behaviour change interventions.

As discussed in the previous section, other studies have not found attitudes to be a reliable predictor of behaviour change. This is because they have assessed general attitudes to conservation rather than measuring attitudes to a specific behaviour such as volunteering. For example Waylen et al. (2009), in the study of attitudes towards two critically endangered species, the leatherback turtle (*Dermochelys coriacea*) and the Trinidad piping-guan (*Pipile pipile*), reported that attitudes towards conservation did not necessarily predict behaviour. Hunting remained a popular pastime even among respondents who had a positive attitude towards conservation and recognised that hunting threatened conservation. However, this is beacuse general attitudes to conservation and the species were measured, rather than the specific behaviour of hunting, which resulted in a mismatch between the attitude and the behaviour investigated.

Having the knowledge that attitudes are an important factor in predicting volunteering behaviour for saiga conservation is useful because it can inform the design of interventions. If the study had only collected information on general attitudes, as currently gathered in most conservation research, it would lack behaviour-specific beliefs and vital information about social norms and PBC.

Subjective norms were the most significant factor in predicting volunteering behaviour in this system. Social norms have previously been effective for the management of common pool resources such as pasture management by nomadic pastoralists. In Mongolia temporal

and spatial grazing norms control when and where herders can graze their stock, and a norm of co-operation safeguards access between neighbouring herders' pasture in the event of climatic disasters such as drought or winter storms (Fernandez-Gimenez, 2000). In Guyana changing social norms in a culturally sensitive way and applying informal social pressures made it unacceptable to overfish the Arapaima gigas fish (Fernandes, 2006). The fact that respondents feel there is social pressure to volunteer to conserve saiga can be harnessed to further strengthen the social norm and encourage participation in future conservation interventions.

In this study PBC was not found to be a significant in predicting intention to volunteer for saiga conservation. In a review of theories of behaviour and how they have been used in the context of conservation, St John et al. (2010) could not find any examples of studies that had quantified the influence of PBC. So even though PBC was not a significant factor in relation to this study, it may be significant in other contexts. Another reason PBC may not have been a significant factor is that the items that were chosen to address this component may not have been appropriate, which was indicated by the low correlation between control beliefs and PBC. Ajzen (2002) warns that studies should not assume that direct measures are obtained by asking a few arbitrarily selected questions, or by adapting items used in previous studies. Although this approach can yield findings of interest, it can produce measures with relatively low reliabilities and lead to an underestimate of the relations among the theory's constructs and of its predictive validity. To secure reliable, internally consistent measures, it is necessary to select appropriate items through an elicitation study with open-ended questions to assess a group's behavioural, normative and control beliefs. Unfortunately this was not possible in this study due to logistical reasons. Time and language proved to be the most significant constraints. The fact that the research assistants did not speak English greatly restricted the interactions and meant limited information was gained from open-ended questions in the survey.

This study used self-reported behaviour as a proxy for actual behaviour, which was found to be significantly related to behavioural intention. However, it has been argued that self-reported behaviour does not completely reflect people's actual behaviour but reflects their perceptions or beliefs about their own behaviour (Chao, 2012). Survey research has

produced relatively robust findings regarding the relationship between behaviour-specific norms, intentions, attitudes, and beliefs and self-reported conservation behaviour. However, the validity of self-reported behaviour as an indicator of actual behaviour is still problematic (Vinning and Ebreo, 2002).

In addition, some research suggests that the predictors of self-reported behaviour and observed behaviour are different. For example, researchers who have been able to collect both self-reports and either direct or indirect measures of recycling behaviour have shown that the two assessments do not always correspond. In fact, since recycling is perceived as socially approved, respondents often systematically overestimate the extent to which they perform this behaviour (Corral-Verdugo, 1997). It has been recommend that researchers collect direct measures of behaviour if possible and that in those instances where this is difficult, that they develop innovative means of assessing behaviour indirectly (Vinning and Ebreo, 2002). To be able to obtain direct measures of volunteering behaviour such things as records of volunteering hours or direct observations of volunteering would be required. This is not feasible at the current time, but if there was a volunteering programme in place it would be achievable.

Vinning and Ebreo (2002) noted that most studies look at the individual, with very few studies exploring different variables that influence conservation behaviour across communities and called for this to be done. In this study the use of a GLM to analyse several levels of variables, allowed for the inclusion of variables related to different contexts such as village of residence. Employment status and village of residence were found to be related to intention and subjective norm. Those that are unemployed and live in Nursai have lower perceived social pressure to become involved in volunteering. This type of information can help conservation organisations target interventions to specific areas or groups of people.

Indirect drivers of behaviour play an important role, they are the foundations of direct measures and are expected to be correlated (Ajzen, 2002). In this study behavioural beliefs and normative beliefs were found to be significantly correlated with direct measures. By including indirect measures into the study we can gain insight into the underlying cognitive foundation and understand why people hold certain attitudes, subjective norms, and PBC.

Normative beliefs were the most significant indirect measure. Normative beliefs are the perceived behavioural expectations of individuals or groups as the person's spouse, family, and friends. Conservation organisations can promote volunteering to the local community by using the perception of social pressure to engage in this behaviour.

5.3 Conservation of saigas: threats and interventions

The majority of respondents identified hunting by people as the main threat to saiga. This is very positive, as in a study in the same region four years ago very few adults rated hunting as a major threat and stated that disease was the main issue (Samuel, 2011). Although, this could be due to the fact that the previous study took place shortly after a mass mortality event. Alternatively, it could potentially demonstrate a shift in locus of control from external to internal. Locus of control represents an individual's perception of whether or not they have the ability to bring about change through their own behaviour (Hines et al., 1987). An individual with an internal locus of control believes their activities are likely to have a positive impact, so will be more willing to volunteer in saiga conservation. However, if the local community perceive that outsiders are responsible for hunting, they may not have an internal locus of control. So any conservation messages need to communicate effectively what individuals can do to effectively help saigas in spite of the hunters.

With regards to the type of conservation activities people were willing to participate in, over half of the respondents stated they would be prepared to attend saiga awareness events. This demonstrates that there is a demand in the local community for awareness events, and suggests SD could be extended include the whole village rather than being centred around particular schools.

Over a quarter of respondents were willing participate in activities that involve much higher levels of participation, such as to helping collect ecological data or organising events. This is interesting because a previous study that used WTP as a proxy for intention to contribute to saiga conservation received a number of protest bids from people that were not willing to participate in any way. The reason given by respondents for protest bids was that the government or international community should be responsible for conservation. It was

suggested that the reason for this, could be a legacy from the Soviet era when government provided for and controlled many aspects of daily life (Howe et al., 2011). The results of this study could indicate that attitudes are slowly changing with regards to who should take responsibility for the conservation of the local environment.

When respondents were asked to rate which interventions would be the most effective, increased penalties and increased enforcement were both in the top three. Although respondents are now much more willing to participate in conservation action, these two responses may have been chosen due to the nature of the illegal activity in the region. In the Kazakh part of the Ustyurt region poaching occurred in more organised commercial groups with less household involvement, so a stronger focus on law enforcement may be needed in addition to community based interventions (Phillipson and Milner-Gulland, 2011).

Respondents rated direct public involvement through local monitoring as the second most important intervention. There has already been a successful participatory monitoring scheme in the Ural region (Chilton, 2011). This could potentially be an intervention that could be successfully re-introduced.

5.4 Recommendations for future conservation interventions in Ural

The results of this study have highlighted several recommendations for future conservation work in Ural and other regions:

- Education and awareness campaigns such as SD should target the whole community and not just focus on schools.
- SWC should use a variety of teaching methods, including direct learning experiences such as field-trips to the steppe.
- The SWC could start a young volunteers programme to instil volunteering behaviour at a young age
- A volunteer programme, with an integrated monitoring and evaluation component, could be established to encourage participation of people willing to volunteer
- Outreach to the region should continue to build upon people's willingness to help and increase local ownership of SD and SWC

- Interventions should utilise the existing social norms and positive attitudes to saiga conservation to encourage participation
- Information provided to residents should be specific about what actions people can undertake to conserve saiga
- The possibility of reviving a participatory monitoring scheme should be explored further
- Continued monitoring and evaluation of conservation interventions

5.5 Recommendations for future research

This study provides a number of broader lessons for research on conservation behaviour:

- Studies using TPB should ensure that the targeted behaviour is specific and clearly defined
- Analysis of each TPB item should be conducted so that the significance of each item can be calculated in order to determine the specific beliefs that have the greatest influence on intentions
- Studies should explore the effects of how different variables such as age, gender and employment impact individuals willingness to volunteer so that interventions can be adapted for different groups

5.6 Concluding remarks

To conclude, the TPB is an effective framework for ascertaining which factors influence conservation behaviours and should be adapted and used in future research to inform public engagement in saiga conservation. In the Ural region the most important factors linked to willingness to volunteer to conserve saiga are subjective norms and attitudes. In light of this, conservation initiatives should incorporate this into the design of their education and awareness events. Awareness events should provide specific information to people on how they can help personally become involved in conservation. Understanding the drivers of behavioural change is vitally important the development of any public engagement strategy to involve people in conservation.

6 REFERENCES

Ajzen, I. (2002) Constructing a TPB Questionnaire: Conceptual and Methodological Considerations.

Ajzen, I. & Fishbein, M. (1980) Understanding attitudes and predicting social. *Behaviour.Englewood Cliffs, NJ: Prentice-Hall.*

AJZEN, I. (1991) THE THEORY OF PLANNED BEHAVIOR. *Organizational Behavior and Human Decision Processes.* 50 (2), 179-211.

Balmford, A. & Cowling, R. M. (2006) Fusion or failure? The future of conservation biology. *Conservation Biology.* 20 (3), 692-695.

Bandura, A. & McClelland, D. C. (1977) Social learning theory.General Learning Press, New Jersey.

Bekenov, A. B., Blank, D. A., Grachev, Y. & Plakhov, K. N. Antelopes. Part 4: North Africa, the Middle East, and Asia. Global Survey and Regional Action Plans. In: Mallon, D. P. & Kingswood, S. C. (eds.) *SSC Antelope Specialist Group.* Gland, Switzerland and Cambridge, UK, IUCN. pp.134-140.

Bryant, C. K. & Hungerford, H. R. (1977) An analysis of strategies for teaching environmental concepts and values clarification in kindergarten. *The Journal of Environmental Education.* 9 (1), 44-49.

Burton, M. (1999) An assessment of alternative methods of estimating the effect of the ivory trade ban on poaching effort. *Ecological Economics.* 30 (1), 93-106.

Carson, R. T. (2000) Contingent valuation: A user's guide. *Environmental Science & Technology.* 34 (8), 1413-1418.

Chao, Y. (2012) Predicting people's environmental behaviour: theory of planned behaviour and model of responsible environmental behaviour. *Environmental Education Research.* 18 (4), 437-461.

Chilton, H. (2011) *The where and why of saiga distribution in West Kazakhstan.* MSc. Imperial College London.

Churchman, A. (1987) Can Resident Participation in Neighborhood Rehabilitation Programs Succeed? *Neighborhood and community environments.* , Springer. pp. 113-162.

CMS. (2010) *Revised overview report on the second meeting of the signatories to the memorandum of understanding concerning conservation, restoration and sustainable use of the saiga antelope.* Convention on Migratory Species.

Corral-Verdugo, V. (1997) Dual 'realities' of conservation behavior: self-reports vs observations of re-use and recycling behavior. *Journal of Environmental Psychology.* 17 (2), 135-145.

Cowling, R. M. (2014) Let's Get Serious About Human Behavior and Conservation. *Conservation Letters.* 7 (3), 147-148.

Damerell, P. (2009) *From knowledge to behaviour: can environmental education realise its potential?* MSc. Imperial College London.

Damerell, P., Bykova, E. & Milner-Gulland, E. J. (2011) *The Impact of Community Conservation Initiatives in the Uzbek Ustyurt.* London.

DeYoung, R. (1996) Some psychological aspects of reduced consumption behavior - The role of intrinsic satisfaction and competence motivation. *Environment and Behavior.* 28 (3), 358-409.

DEYOUNG, R. (1993) Changing Behavior and Making it Stick - the Conceptualization and Management of Conservation Behavior. *Environment and Behavior.* 25 (4), 485-505.

Deyoung, R. (1989) Exploring the Difference between Recyclers and Non-Recyclers - the Role of Information. *Journal of Environmental Systems.* 18 (4), 341-351.

Duerden, M. D. & Witt, P. A. (2010) The impact of direct and indirect experiences on the development of environmental knowledge, attitudes, and behavior. *Journal of Environmental Psychology.* 30 (4), 379-392.

Fernandes, D. (2006) "More eyes watching…" Community-based management of the Arapaima (Arapaima gigas) in Central Guyana. *Eleventh conference of the International Association for the Study of Common Property. Digital Library of the Commons, Bloomington, Indiana. Available from http://dlc. dlib. indiana. edu/archive/00001894/(accessed August 2014).*

Fernandez-Gimenez, M. E. (2000) The role of Mongolian nomadic pastoralists' ecological knowledge in rangeland management. *Ecological Applications.* 10 (5), 1318-1326.

Fishbein, M. (1975) *Belief, attitude, intention and behavior : an introduction to theory and research.* Reading, Mass. ; London, Addison-Wesley.

Fleiss, J. L. (1981) *Statistical methods for rates and proportions.* 2nd edition. New York ; Chichester, Wiley.

Francis, J., Eccles, M., Johnston, M., Walker, A., Grimshaw, J. & Foy, R. (2004) *Theory of Planned Behaviour Questionnaires: Manual for Researchers.* Newcastle upon Tyne, United Kingdom, European Union. Report number: ReBEQI WP2.

Frick, J., Kaiser, F. G. & Wilson, M. (2004) Environmental knowledge and conservation behavior: Exploring prevalence and structure in a representative sample. *Personality and Individual Differences.* 37 (8), 1597-1613.

Gavin, M. C., Solomon, J. N. & Blank, S. G. (2010) Measuring and Monitoring Illegal Use of Natural Resources. *Conservation Biology.* 24 (1), 89-100.

Gifford, R. & Nilsson, A. (2014) Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology.* 49 (3), 141-157.

Grob, A. (1995) A Structural Model of Environmental Attitudes and Behavior. *Journal of Environmental Psychology.* 15 (3), 209-220.

Haab, T. C., Interis, M. G., Petrolia, D. R. & Whitehead, J. C. (2013) From Hopeless to Curious? Thoughts on Hausman's "Dubious to Hopeless" Critique of Contingent Valuation. *Applied Economic Perspectives and Policy.* 35 (4), 593-612.

Heimlich, J. E. & Ardoin, N. M. (2008) Understanding behavior to understand behavior change: a literature review. *Environmental Education Research.* 14 (3), 215-237.

Hines, J. M., Hungerford, H. R. & Tomera, A. N. (1987) Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education.* 18 (2), 1-8.

Holmes, C. M. (2003) The influence of protected area outreach on conservation attitudes and resource use patterns: a case study from western Tanzania. *Oryx.* 37 (3), 305-315.

Howe, C., Medzhidov, R. & Milner-Gulland, E. J. (2011) Evaluating the relative effectiveness of alternative conservation interventions in influencing stated behavioural intentions: the saiga antelope in Kalmykia (Russia). *Environmental Conservation.* 38 (1), 37-44.

Inamdar, A., de Jode, H., Lindsay, K. & Cobb, S. (1999) Conservation - Capitalizing on nature: Protected area management. *Science.* 283 (5409), 1856-1857.

IUCN. (2008) *Saiga tatarica. The IUCN Red List of Threatened Species. Version 2014.2.* [Online] Available from: http://www.iucnredlist.org/details/19832/0 [Accessed 21 August 2014].

Kaplan, R., Kaplan, S. & Ryan, R. (1998) *With People in Mind: Design And Management Of Everyday Nature.* Washington D.C., Island Press.

Kareiva, P. & Marvier, M. (2012) What Is Conservation Science? *Bioscience.* 62 (11), 962-969.

Keith, D. A., Martin, T. G., McDonald-Madden, E. & Walters, C. (2011) Uncertainty and adaptive management for biodiversity conservation. *Biological Conservation.* 144 (4), 1175-1178.

Kerven, C., Alimaev, I. I., Behnke, R., Davidson, G., Malmakov, N., Smailov, A. & Wright, I. Fragmenting Pastoral Mobility: Changing Grazing Patterns in Post-Soviet Kazakhstan. *USDA Forest Service Proceedings 39. 2006,* pp.99-110.

Kock, R., Grachev, Y., Usenbayev, A., Zuther, S., Klimanova, O., Dieterich, T. & Izimbergenova, G. (2011) A retrospective assessment of saiga antelope Saiga tatarica die-off in Western Kazakhstan 2010-2011. *Saiga News*,(14),1–4

Kuehl, A., Balinova, N., Bykova, E., Arylov, Y. N., Esipov, A., Lushchekina, A. A. & Milner-Gulland, E. J. (2009) The role of saiga poaching in rural communities: Linkages between attitudes, socio-economic circumstances and behaviour. *Biological Conservation.* 142 (7), 1442-1449.

Landis, J. R. & Koch, G. G. (1977) Measurement of Observer Agreement for Categorical Data. *Biometrics.* 33 (1), 159-174.

McKenzie-Mohr, D. (2000) Fostering sustainable behavior through community-based social marketing. *American Psychologist.* 55 (5), 531-537.

McKenzieMohr, D., Nemiroff, L. S., Beers, L. & Desmarais, S. (1995) Determinants of responsible environmental behavior. *Journal of Social Issues.* 51 (4), 139-156.

Measham, T. G. & Barnett, G. B. (2008) Environmental Volunteering: motivations, modes and outcomes. *Australian Geographer.* 39 (4), 537-552.

Miller, J. R. (2005) Biodiversity conservation and the extinction of experience. *Trends in Ecology & Evolution.* 20 (8), 430-434.

Milner-Gulland, E. J., Bukreevea, O. M., Coulson, T., Lushchekina, A. A., Kholodova, M. V., Bekenov, A. B. & Grachev, I. A. (2003) Conservation - Reproductive collapse in saiga antelope harems. *Nature.* 422 (6928), 135-135.

Milner-Gulland, E. J., Kholodova, M. V., Bekenov, A., Bukreeva, O. M., Grachev, I. A., Amgalan, L. & Lushchekina, A. A. (2001) Dramatic declines in saiga antelope populations. *Oryx.* 35 (4), 340-345.

Monroe, M. C. (2003) Two avenues for encouraging conservation behaviors. *Human Ecology Review.* 10 (2), 113-125.

Mussrov, A. (2012) *Economic Growth and Poverty Reduction: The Kazakh Story.* Norwegian Institute of International Affairs. Report number: 1.

Norris, K. S. & Jacobson, S. K. (1998) Content analysis of tropical conservation education programs: elements of success. *The Journal of Environmental Education.* 30 (1), 38-44.

Ozanne, L. K., Humphrey, C. R. & Smith, P. M. (1999) Gender, environmentalism, and interest in forest certification: Mohai's paradox revisited. *Society & Natural Resources.* 12 (6), 613-622.

Ozanne, L. K., Humphrey, C. R. & Smith, P. M. (1999) Gender, environmentalism, and interest in forest certification: Mohai's paradox revisited. *Society & Natural Resources.* 12 (6), 613-622.

Pearce, J. M. & Hall, G. (1992) Stimulus significance, conditionability, and the orienting response in rats. *Attention and Information Processing in Infants and Adults: Perspectives from Human and Animal Research.* , 137-160.

Phillipson, A. & Milner-Gulland, E. J. (2011) *Addressing the Illegal trade in the Critically Endangered Ustyurt Saiga. USAID SCAPES Ustyurt Landscape Conservation Initiative Project. Socio-economic Research Component.* London.

Pimm, S. L., Russell, G. J., Gittleman, J. L. & Brooks, T. M. (1995) The Future of Biodiversity. *Science.* 269 (5222), 347-350.

Pittman, T. S., Emery, J. & Boggiano, A. K. (1982) Intrinsic and Extrinsic Motivational Orientations - Reward-Induced Changes in Preference for Complexity. *Journal of Personality and Social Psychology.* 42 (5), 789-797.

Pullin, A. S. & Knight, T. M. (2001) Effectiveness in conservation practice: Pointers from medicine and public health. *Conservation Biology.* 15 (1), 50-54.

Robinson, S. & Milner-Gulland, E. J. (2003) Political change and factors limiting numbers of wild and domestic ungulates in Kazakhstan. *Human Ecology.* 31 (1), 87-110.

Salafsky, N., Margoluis, R., Redford, K. H. & Robinson, J. G. (2002) Improving the practice of conservation: a conceptual framework and research agenda for conservation science. *Conservation Biology.* 16 (6), 1469-1479.

Samuel, C. (2011) *Evaluating the success of a public engagement project for the conservation of the Ural Saiga population in Kazakhstan.* MSc. Imperial College London.

Saunders, C. D. (2003) The emerging field of conservation psychology. *Human Ecology Review.* 10 (2), 137-149.

SCA. (2013) *Saiga News, Issue 17.* http://www.saiga-conservation.com/saiga_news.html edition.

SCA. Milner-Gulland, E. J. (ed.) (2012) *Building public engagement for conservation of the Ural saiga population following a mass die-off . People's Trust for Endangered Species Project Completion Report.* .

Schultz, P. W., Oskamp, S. & Mainieri, T. (1995) Who Recycles and when - a Review of Personal and Situational Factors. *Journal of Environmental Psychology.* 15 (2), 105-121.

Shivaldova, N. (2013) Steppe Wildlife Clubs, fom an initiative to a result *Saiga News.* (17), 1-4.

Singh, N. J., Grachev, I. A., Bekenov, A. B. & Milner-Gulland, E. J. (2010) Saiga antelope calving site selection is increasingly driven by human disturbance. *Biological Conservation.* 143 (7), 1770-1779.

Souto, T., Deichmann, J. L., Nunez, C. & Alonso, A. (2014) Classifying conservation targets based on the origin of motivation: implications over the success of community-based conservation projects. *Biodiversity and Conservation.* 23 (5), 1331-1337.

St John, F. A. V., Edwards-Jones, G. & Jones, J. P. G. (2010) Conservation and human behaviour: lessons from social psychology. *Wildlife Research.* 37 (8), 658-667.

Stem, C., Margoluis, R., Salafsky, N. & Brown, M. (2005) Monitoring and evaluation in conservation: a review of trends and approaches. *Conservation Biology.* 19 (2), 295-309.

Sussman, R. & Gifford, R. (2013) Be the Change You Want to See: Modeling Food Composting in Public Places. *Environment and Behavior.* 45 (3), 323-343.

Sutherland, W. J., Pullin, A. S., Dolman, P. M. & Knight, T. M. (2004) The need for evidence-based conservation. *Trends in Ecology & Evolution.* 19 (6), 305-308.

UN. (2014) *UN Data Kazakhstan.* [Online] Available from: https://data.un.org/CountryProfile.aspx?crName=Kazakhstan#Social [Accessed 24/08/14].

UNESCO UNEP. (1976) *The Belgrade charter. Connect: UNESCO-UNEP Environmental Education.*, no. 1: 1–2. .

Uzzell, D. (1994) *Children as catalysts for environmental change.* London, European Commission Directorate General for Science Research and Development Joint research Centre.

van Wilgen, B. W. & Biggs, H. C. (2011) A critical assessment of adaptive ecosystem management in a large savanna protected area in South Africa. *Biological Conservation.* 144 (4), 1179-1187.

Vining, J. & Ebreo, A. (2002) Emerging theoretical and methodological perspectives on conservation behavior. In: Bechtel, R. & Churchman, A. (eds.). *New Handbook of Environmental Psychology.* 1st edition. New York, Wiley. pp. 541-558.

Vining, J. & Ebreo, A. (1990) What makes a recycler? A comparison of recyclers and nonrecyclers. *Environment and Behavior.* 22 (1), 55-73.

Voicu, B. & Voicu, M. (2009) Volunteers and volunteering in Central and Eastern Europe. *Sociológia.* 41 (6), 539-563.

Waylen, K. A., Fischer, A., McGowan, P. J. & Milner-Gulland, E. (2012) Interactions Between a Collectivist Culture and Buddhist Teachings Influence Environmental Concerns and Behaviors in the Republic of Kalmykia, Russia. *Society & Natural Resources.* 25 (11), 1118-1133.

Waylen, K. A., McGowan, P. J. K., Milner-Gulland, E. J. & Pawi Study Grp. (2009) Ecotourism positively affects awareness and attitudes but not conservation behaviours: a case study at Grande Riviere, Trinidad. *Oryx.* 43 (3), 343-351.

Wilson, J. (2000) Volunteering. *Annual Review of Sociology.* 26, 215-240.

World Bank. (2014) *Kazakhstan Overview.* [Online] Available from: http://www.worldbank.org/en/country/kazakhstan/overview [Accessed 24/08/14].

Zubair, M. & Garforth, C. (2006) Farm level tree planting in Pakistan: The role of farmers' perceptions and attitudes. *Agroforestry Systems.* 66 (3), 217-229.

7 APPENDICES

7.1 Appendix I - Questionnaire

Interviewer Section

Interviewer Name:……..
Reference Number:……..
Date: ……
Village Name:……..

Introductory Statement

Good morning/afternoon. My name is (interviewer's name) and I come from (birthplace of interviewer). This is (if second interviewer present), from (birthplace of interviewer). (and if necessary, this is (student's name), a researcher from Imperial College in London, England). We are carrying out research on behalf of the Saiga Conservation Alliance to understand knowledge and attitudes to the steppe environment and conservation. The answers you give will be kept anonymous. Are you happy to take part?

Section 1: About You

1.1) Age *(tick as appropriate)?*

a) 16-20 ☐
b) 21-40 ☐
c) 41-60 ☐
d) 61 or over ☐

1.2) Gender *(tick as appropriate)*:

a) Female ☐
b) Male ☐

1.3) Village (or nearest).....

1.4) Province (Oblast)……..

1.5) Ethnicity

a) Kalmyk ☐ b) Russian ☐ c) Uzbek ☐ d) Kazakh ☐
e) Other……

1.6) What is your highest level of education *(tick as appropriate)*?

a) Primary ☐
b) Secondary ☐
c) Vocational Diploma ☐
d) University Degree ☐
e) None ☐

1.7) What is your occupation *(tick as appropriate)*?

a) Working ☐ Please specify…….
b) Unemployed (with profession) ☐ Please specify…….
c) Unemployed (no profession) ☐
d) State pension ☐
e) Student ☐
f) Homemaker ☐
g) Other ☐ Please specify……..

1.8) Do you have children that are members of a Steppe Wild Club? *(tick as appropriate)*

Yes ☐
No ☐
No children ☐

a) If so what is the club's name?.....
b) When did they join (year)?.....
c) Why did they join?.....

1.9) Have you ever attended a Saiga Day festival, if so how many?.....

a) Where were they held?.....
b) Why did/didn't you go?.....

<u>Section 2: Nature Knowledge Quiz</u>

2.1) Can you name these Steppe animals?




a)……. b)……. c)…… d)……

When did you last see Animal a)……. and where?……
When did you last see Animal b)……. and where?……
When did you last see Animal c)…….and where?……
When did you last see Animal d)…….and where?.....

2.2) In which countries is saiga antelope found *(tick all that apply)*?

- Russia ☐
- Uzbekistan ☐
- Afghanistan ☐
- Kazakhstan ☐
- United Kingdom ☐
- Mongolia ☐
- China ☐
- Georgia ☐

2.3) Can you tell me if *(tick one only)*:

a) Both males and females have horns ☐
b) Only males have horns ☐
c) Only females have horns ☐
d) I am not sure ☐

2.4) Do you know if saiga change colour during their lives *(tick one only)*?

a) Yes they change ☐
b) No they stay the same ☐
c) I'm not sure ☐

If yes, are they:

- A different colour when they are born ☐
- White in the winter or fawn in the summer ☐
- Other (describe)_____ ☐

2.5) From what you understand about your local wildlife regulations *(tick one only)*?

a) It is always illegal to hunt saigas ☐
b) It is legal to hunt saigas ☐
c) It is sometimes legal to hunt saigas ☐
d) I don't know ☐

2.6 In your opinion, what is the greatest threat to the saiga in your oblast *(tick one only)*?

a. Extreme weather ☐
b. Development and infrastructure ☐
c. Hunting by people ☐
d. Predation (e.g. by wolves) ☐
e. Lack of Grass ☐
f. Other *(please state)*…… ☐

Section 3: Your thoughts on the Steppe Environment *(For this section there is no right or wrong answer, we are just interested in your opinion*

3.1) We would like you to respond to a collection of statements *(circle your response)*:

a) The environment in your oblast is currently in a good condition.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

b) The hunting of any animal is acceptable if done sustainably.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

c) If there were no more saiga in this country (i.e, they went nationally extinct), I would not mind.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

d) The State should increase its protection of the wolf.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

e) The State should increase its protection of the saiga.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

f) People found to have killed protected species should face a heavy penalty.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

g) Only once the needs of the local people have been met should the state care about protecting wildlife.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

h) I would personally be prepared to act on a volunteer basis to help conserve saiga antelopes

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

3.2) If you agreed with statement h, what would you personally be prepared to do to conserve saiga *(tick all that apply)*?

a. Help with collecting ecological data on saiga populations ☐

b. Participate in more saiga awareness events ☐
c. Lead/organise saiga awareness events or clubs ☐
d. Talk about the importance if saiga conservation to family/friends ☐
e. Donate money _____ (R /year) ☐
f. Report to authorities any saiga poaching ☐

g. Report to authorities any selling or consumption of saiga meat ☐
h. Talk to people about why they should not kill saiga ☐
i. Talk to people about why they should not eat saiga meat ☐
j. Make sure not to disturb or approach saigas when seen ☐
k Report sightings of saigas to conservationists ☐
l.Other *(please state)*……. ☐

Could you give an explanation for your choices above?.....
……..

3.3) What do you think would be the three most effective approaches to improving the status of the saiga population in your area? Please rank your top three choices in the boxes provided (1 being the most effective, followed by 2 then 3)

a. Improving incomes of local people from their current jobs ☐
b. Help local people to get different jobs (e.g. by providing loans or grants for small businesses) ☐
c. Increase law enforcement effort (e.g. more rangers) ☐
d. Increase penalties for people who are caught ☐
e. Increase direct public involvement in saiga conservation (e.g. through local people helping to monitor saigas) ☐
f. Change people's views on the value and importance of saigas (e.g. through events and festivals) ☐

Section 4: Your thoughts on Saiga Conservation*(For this section there is no right or wrong answer, we are just interested in your opinion*

4.1) a. What are the organisations (non governmental and governmental) involved in saiga conservation in this area? *(Answer in table below)*
b. What are the roles and responsibilities of each organisation? (*Answer in table below)*

Name of organisation	**Role and responsibilities**

4.2) What opportunities for individuals to become involved in saiga conservation are available in your community?.....
……

Please respond to the following statements using the specified scale *(circle the response):*

4.3) It is important for people to participate in saiga conservation

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.4) Personally becoming involved in saiga conservation would be beneficial to me

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.5) Thinking about the future, how likely is it that you might help with saiga conservation

Definitely not *Probably not* *Possibly* *Very Probably* *Definitely* *Don't Know*

4.6) My friends and family think that participating in saiga conservation is important

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.7) The people that are the most important in my life would approve of me helping with saiga conservation

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.8) How my neighbours view conservation influences whether I participate in it

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.9) Generally speaking, I comply with my family and friends wishes

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.10) I have or could obtain the knowledge and resources I need to conserve saigas

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.11) There are organisations who are already involved in saiga conservation who could help me participate in it if I wanted to

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.12) I am too busy to become involved in saiga conservation

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.13) I would require a financial incentive to become involved in saiga conservation

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.14) I would need to gain more knowledge and skills before becoming involved in saiga conservation

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

4.15) Please estimate how often you have talked about the conservation of saigas to your family or friends in the past year

Never *Once* *Monthly* *Weekly* *Daily* *Don't Know*

4.16) Please estimate how often you have helped with saiga conservation in the past year

Never *Once* *Monthly* *Weekly* *Daily* *Don't Know*

If you have helped what did you do…….. Where was this…….

4.17) What are the advantages to you of becoming involved in saiga conservation?.....

…… ☐
…… ☐
…… ☐
…… ☐

4.18) What are the disadvantages to you of becoming involved in saiga conservation

…….. ☐
…… ☐
…… ☐
……. ☐

4.19) What factors would prevent you from becoming involved in saiga conservation

……. ☐
……. ☐
…… ☐
…… ☐

4.20) What factors would enable you to become involved in saiga conservation

…… ☐
…… ☐
……. ☐

7.2 Appendix II – Children's SD Quiz

Date:……
Village Name:……

Welcome to Saiga Day!

We would like to invite you to participate in this short quiz on the Steppe. All completed entries will be entered into a prize draw. The information taken from this quiz will be help the Saiga Conservation Alliance to improve future Saiga Days and the Steppe Wildlife Clubs.

Section 1: About You

1.1) Your name?.....

1.2) Age:…….

1.3) Gender:

a) Female ☐
b) Male ☐

1.4) Village (or nearest).....

1.5) Province (Oblast)…….

1.6) Ethnicity

a) Kalmyk ☐ b) Russian ☐ c) Uzbek ☐ d) Kazakh ☐
e) Other……

1.7). Are you a member of Steppe Wild Club? *(tick as appropriate)*

Yes ☐
No ☐

a) If so what is the club's name?.....
b) When did you join (year)?.....
c) Why did you join?.....

1.7) How many Saiga Day festivals have you attended?.....
a) Where were they held?.....
b) Why did/do you go?.....

Section 2: Nature Knowledge Quiz

2.1) Can you name these Steppe animals?




a)…… b)…… c)…… d)……

When did you last see Animal a)…… and where?……
When did you last see Animal b)…… and where?……
When did you last see Animal c)…… and where?……
When did you last see Animal d)……..and where?……

2.2) In which countries is saiga antelope found *(tick all that apply)*?

- Russia ☐
- Uzbekistan ☐
- Afghanistan ☐
- Kazakhstan ☐
- United Kingdom ☐
- Mongolia ☐
- China ☐
- Georgia ☐

2.5) Can you tell me if *(tick one only)*:

a) Both males and females have horns ☐
b) Only males have horns ☐
c) Only females have horns ☐
d) I am not sure ☐

2.6) Do you know if saiga change colour during their lives *(tick one only)*?

a) Yes they change ☐
b) No they stay the same ☐
c) I'm not sure ☐

If yes, are they:

- A different colour when they are born ☐
- White in the winter or fawn in the summer ☐
- Other (describe)_____ ☐

2.5) From what you understand about your local wildlife regulations *(tick one only)*?

a) It is always illegal to hunt saigas ☐
b) It is legal to hunt saigas ☐
c) It is sometimes legal to hunt saigas ☐
d) I don't know ☐

2.6 In your opinion, what is the greatest threat to the saiga in your oblast *(tick one only)*?

a. Extreme weather ☐
b. Development and infrastructure ☐
c. Hunting by people ☐
d. Predation (e.g. by wolves) ☐
e. Lack of Grass ☐
f. Other *(please state)*…… ☐

(***If you are under 12 years then you have finished the quiz! Please return the quiz to the box. If you are over 12 years continue on to section 3.***

Section 3: Your thoughts on the Steppe Environment *For this section there is no right or wrong answer, we are just interested in your opinion,*

3.1) We would like you to respond to a collection of statements *(circle your response)*:

a) The environment in your oblast is currently in a good condition.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

b) The hunting of any animal is acceptable if done sustainably.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

c) If there were no more saiga in this country (i.e, they went nationally extinct), I would not mind.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

d) The State should increase its protection of the wolf.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

e) The State should increase its protection of the saiga.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

f) People found to have killed protected species should face a heavy penalty.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

g) Only once the needs of the local people have been met should the state care about protecting wildlife.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

h) I would personally be prepared to act on a volunteer basis to help conserve saiga antelopes

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

3.2) If you agreed with statement h, what would you personally be prepared to do to conserve saiga *(tick all that apply)*?

a. Help with collecting ecological data on saiga populations ☐

b. Participate in more saiga awareness events ☐
c. Lead/organise saiga awareness events or clubs ☐
d. Talk about the conservation of saiga to family/friends ☐
e. Donate money _____ (R /year) ☐
f. Other *(please state)*……. ☐

Could you give an explanation for your choice above?.....
……..

3.3. What do you think would be the three most effective approach to improving the status of the saiga population in your area? Please rank your top three choices in the boxes provided (1 being the most effective, followed by 2 then 3)

g. Improving incomes of local people from their current jobs ☐
h. Help local people to get different jobs (e.g. by providing loans or grants for small businesses) ☐
i. Increase law enforcement effort (e.g. more rangers) ☐
j. Increase penalties for people who are caught ☐
k. Increase direct public involvement in saiga conservation (e.g. through local people helping to monitor saigas) ☐
l. Change people's views on the value and importance of saigas (e.g. through events and festivals) ☐

Section 4: Your thoughts on Saiga Day

3.5) What was your favourite part of Saiga day?).....
……

3.6) Have you got any suggestions for how to improve Saiga Day in the future?.....
……..

If you have any questions or further comments, please write them here!
……..
……
……..

Thank you for your time, please put your completed questionnaire in the box.

7.3 Appendix III – Adult's SD Quiz

Date: ……..
Village Name:……

Welcome to Saiga Day!

We would like to invite you to participate in this short quiz on the Steppe. All completed entries will be entered into a prize draw. The information taken from this quiz will be help the Saiga Conservation Alliance to improve future Saiga Days and the Steppe Wildlife Clubs.

Steppe Quiz
(Adults Template)

Section 1: About You

1.1) Your name?.....

1.2) Your Age (please tick)?
- a) 16-20 ☐
- b) 21-40 ☐
- c) 41-60 ☐
- d) 61 or over ☐

1.3) Gender:
- a) Female ☐
- b) Male ☐

1.4) Village (or nearest).....

1.5) Province (Oblast)……..

1.6) Ethnicity
- a) Kalmyk ☐ b) Russian ☐ c) Uzbek ☐ d) Kazakh ☐
- e) Other……

1.7). Do you have children that are members of a Steppe Wild Club? *(tick as appropriate)*
- Yes ☐
- No ☐
- No children ☐
- a) If so what is the club's name?.....
- b) When did they join (year)?.....
- c) Why did they join?.....

1.7) How many Saiga Day festivals have you attended (including today)?.....
- a) Where were they held?.....
- b) Why did/do you go?.....

Section 2: Nature Knowledge Quiz

2.1) Can you name these Steppe animals?




a)……. b)……. c)…… d)……

When did you last see Animal a)……. and where?…….
When did you last see Animal b)……. and where?……
When did you last see Animal c)…….and where?……
When did you last see Animal d)…….and where?.....

2.2) In which countries is saiga antelope found *(tick all that apply)*?

- Russia ☐
- Uzbekistan ☐
- Afghanistan ☐
- Kazakhstan ☐
- United Kingdom ☐
- Mongolia ☐
- China ☐
- Georgia ☐

2.7) Can you tell me if *(tick one only)*:

a) Both males and females have horns ☐
b) Only males have horns ☐
c) Only females have horns ☐
d) I am not sure ☐

2.8) Do you know if saiga change colour during their lives *(tick one only)*?

a) Yes they change ☐
b) No they stay the same ☐
c) I'm not sure ☐

If yes, are they:

- A different colour when they are born ☐
- White in the winter or fawn in the summer ☐
- Other (describe)_____ ☐

2.5) From what you understand about your local wildlife regulations *(tick one only)*?

a) It is always illegal to hunt saigas ☐
b) It is legal to hunt saigas ☐
c) It is sometimes legal to hunt saigas ☐
d) I don't know ☐

2.6 In your opinion, what is the greatest threat to the saiga in your oblast *(tick one only)*?

a. Extreme weather ☐
b. Development and infrastructure ☐
c. Hunting by people ☐
d. Predation (e.g. by wolves) ☐
e. Lack of Grass ☐
f. Other *(please state)*…… ☐

Section 3: Your thoughts on the Steppe Environment *(For this section there is no right or wrong answer, we are just interested in your opinion*

3.1) We would like you to respond to a collection of statements *(circle your response)*:

a) The environment in your oblast is currently in a good condition.

Strongly disagree Disagree Neutral Agree Strongly Agree Don't Know

b) The hunting of any animal is acceptable if done sustainably.

Strongly disagree Disagree Neutral Agree Strongly Agree Don't Know

c) If there were no more saiga in this country (i.e, they went nationally extinct), I would not mind.

Strongly disagree Disagree Neutral Agree Strongly Agree Don't Know

d) The State should increase its protection of the wolf.

Strongly disagree Disagree Neutral Agree Strongly Agree Don't Know

e) The State should increase its protection of the saiga.

Strongly disagree Disagree Neutral Agree Strongly Agree Don't Know

f) People found to have killed protected species should face a heavy penalty.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

g) Only once the needs of the local people have been met should the state care about protecting wildlife.

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

h) I would personally be prepared to act on a volunteer basis to help conserve saiga antelopes

Strongly disagree *Disagree* *Neutral* *Agree* *Strongly Agree* *Don't Know*

3.2) If you agreed with statement h, what would you personally be prepared to do to conserve saiga *(tick all that apply)*?

a. Help with collecting ecological data on saiga populations ☐

b. Participate in more saiga awareness events ☐
c. Lead/organise saiga awareness events or clubs ☐
d. Talk about the conservation of saiga to family/friends ☐
e. Donate money _____ (R /year) ☐
f. Other *(please state)*……. ☐

Could you give an explanation for your choice above?.....
…….

3.3. What do you think would be the three most effective approaches to improving the status of the saiga population in your area? Please rank your top three choices in the boxes provided (1 being the most effective, followed by 2 then 3)

m. Improving incomes of local people from their current jobs ☐
n. Help local people to get different jobs (e.g. by providing loans or grants for small businesses) ☐
o. Increase law enforcement effort (e.g. more rangers) ☐
p. Increase penalties for people who are caught ☐
q. Increase direct public involvement in saiga conservation (e.g. through local people helping to monitor saigas) ☐
r. Change people's views on the value and importance of saigas (e.g. through events and festivals) ☐

Section 4: Your thoughts on Saiga Day

3.4) What was your favourite part of Saiga day?.....
……

3.5) Have you got any suggestions for how to improve Saiga Day in the future?
……
……

If you have any questions or further comments, please write them here!
……

Thank you for your time, please put your completed questionnaire in the box.

7.4 Appendix IV – Minimal adequate models

Results of GLM of variables explaining self-reported behaviour (AIC: 277.71)

Explanatory variable	Estimate	SE	t	p
Intercept	-0.51675	0.07862	-6.573	1.66e-09***
Intention	0.20918	0.09918	2.109	0.0372*

Results of GLM of variables explaining intention to volunteer (AIC: 225.67)

Explanatory variable	Estimate	SE	t	p
Intercept	-0.40772	0.18505	-2.203	0.029851*
Attitude score	0.29783	0.09007	3.307	0.001309**
Direct PBC	0.13461	0.12394	1.086	0.280027
Subjective norm	0.67037	0.18204	3.683	0.000373***
Unemployed with profession	-0.06590	0.18861	-0.349	0.727504
Unemployed without profession	-0.56755	0.22998	-2.468	0.015274*
Pensioner	-0.32983	0.16039	-2.056	0.042324*
Homemaker	-0.07629	0.17014	-0.448	0.654826
PBC : Unemployed with	0.08092	0.20398	0.397	0.692407
PBC : Unemployed w/out	-0.36336	0.28264	-1.286	0.201527
PBC : Pensioner	0.42327	0.21781	1.943	0.054767
PBC : Homemaker	-0.27927	0.18509	-1.509	0.134460

Results of GLM of variables explaining attitude towards volunteering (AIC: 253.78)

Explanatory variable	Estimate	SE	t	p
Intercept	0.2491	0.1908	1.306	0.1944
Behavioural belief	0.3736	0.1934	1.932	0.0559.

Results of GLM of TPB variables explaining perceived behavioural control (AIC: 254.28)

Explanatory variable	Estimate	SE	t	p
Intercept	0.33648	0.13178	2.553	0.0121*
Control belief	-0.09625	0.10081	1.413	0.1605
Unemployed with profession	-0.29276	0.20718	1.413	0.1605
Unemployed without profession	-0.04592	0.26742	-0.172	0.8640
Pensioner	0.25750	0.18277	1.409	0.1618
Homemaker	-0.24862	0.19581	-1.270	0.2069

Results of GLM of variables explaining subjective norm (AIC: 76.244)

Explanatory variable	Estimate	SE	t	p
Intercept	0.86619	0.08032	10.784	<2e-16***
Normative belief	0.18100	0.08647	2.093	0.03892*
Unemployed with profession	-0.61619	0.20577	-2.995	0.00348**
Unemployed without profession	-3.6619	0.21281	-1.721	0.08845.
Pensioner	0.07298	0.13727	0.532	0.59616
Homemaker	0.09410	0.12722	0.740	0.46129
Nursai	-0.26678	0.10356	-2.576	0.01148*
Norm belief : Unemployed with	0.40234	0.28101	1.845	0.06799.
Norm belief : Unemployed w/out	0.31900	0.23961	1.331	0.18616
Norm belief : Pensioner	-0.17370	0.14352	-1.210	0.22909
Norm belief : Homemaker	-0.23154	0.13525	-1.712	0.09008.
Unemployed with : Nursai	0.51678	0.18474	2.797	0.00620**
Unemployed w/out : Nursai	0.26678	0.25730	1.037	0.30237
Pensioner : Nursai	0.10052	0.1656	0.607	0.54516
Homemaker : Nursai	0.33176	0.18449	1.798	0.07522.

Results of GLM of variables explaining willingness to help (AIC: 467.46)

Explanatory variable	Estimate	SE	t	p
Intercept	0.11842	0.15126	0.783	0.43489
Knowledge	0.45761	0.13965	3.277	0.00130**
Attitude	0.14325	0.07562	1.894	0.06002.
Unemployed with profession	-0.17939	0.27170	-0.660	0.51005
Unemployed without profession	-0.01299	0.34628	-0.038	0.97013
Pensioner	-0.85665	0.25920	-3.305	0.00188**
Student	-0.14301	0.19786	-0.723	0.47092
Homemaker	0.04787	0.29560	0.161	.087195
Knowledge : Unemployed with	-0.25747	0.25352	-1.016	0.31142
Knowledge : Unemployed w/out	-0.26608	0.49554	-0.537	0.59207
Knowledge : Pensioner	0.40106	0.25356	1.582	0.11576
Knowledge : Student	-0.58248	0.18041	-3.229	0.00152**
Knowledge : Homemaker	-0.66782	0.31713	-2.106	0.03683*

Results of GLM of variables explaining attitude towards conservation of the steppe (AIC: 253.78)

Explanatory variable	Estimate	SE	t	p
Intercept	-0.14626	0.10176	-1.437	0.1525
Knowledge	0.17155	0.07285	2.355	0.0197*
Nursai	0.34775	0.15241	2.282	0.0238*

Results of GLM of variables explaining knowledge of the steppe (AIC: 672.06)

Explanatory variable	Estimate	SE	t	p
Intercept	0.14353	0.12785	1.123	0.2628
Nursai	-0.27097	0.12802	-2.117	0.0354*
Unemployed with profession	-0.26913	0.25576	-1.052	0.2938
Unemployed without profession	0.09520	0.34309	-0.277	0.7816
Pensioner	0.46474	0.21947	2.118	0.0353*
Student	-0.00958	0.15295	-0.063	0.9501
Homemaker	-0.58806	0.24145	-2.435	0.0156*

Results of GLM of variables children's willingness to help (AIC: 153.32)

Explanatory variable	Estimate	SE	t	p
Intercept	0.15560	0.35027	0.444	0.65891
Knowledge	0.10910	0.31894	0.342	0.73383
Attitude	-0.46562	0.25568	-1.821	0.07496.
Non-member	-0.46935	0.38619	-1.215	0.23032
Male	0.06775	0.26541	0.255	0.79963
Knowledge : Non-member	-0.67462	0.33085	-2.039	0.04709*
Attitude : Non-member	0.86632	0.29804	2.907	0.00556**
Knowledge : Male	0.46993	0.23024	2.041	0.04689*

Results of GLM of variables explaining children's attitude towards the steppe (AIC: 155.08)

Explanatory variable	Estimate	SE	t	p
Intercept	0.05606	0.13088	0.428	0.6701
Knowledge	0.28470	0.11529	2.469	0.0168*

Results of GLM of variables explaining children's knowledge of the steppe (AIC: 249.96)

Explanatory variable	Estimate	SE	t	p
Intercept	0.6711	0.1880	3.569	0.000577***
Non-member	-0.9080	0.2187	-4.151	7.49e-05***

7.5 Appendix V – Maximal models

Results of GLM of variables explaining self-reported behaviour (AIC: 297.66)

Explanatory variable	Estimate	SE	t	p
Intercept	-0.41712	0.23152	-1.802	0.0747.
Intention	0.22996	0.24815	0.927	0.3564
Nursai	-0.25500	0.30343	-0.40	0.4027
Unemployed with profession	-0.12270	0.34981	-0.351	0.7265
Unemployed without profession	-0.18288	0.44076	-0.415	0.6791
Pensioner	-0.12667	0.31092	-0.407	0.6846
Homemaker	0.13050	0.32688	0.399	0.6906
Intention : Nursai	-0.01693	0.24475	-0.069	0.9450
Intention : Unemployed with	0.30104	0.38677	0.778	0.4383
Intention : Unemployed w/out	-0.02996	0.52209	-0.057	0.9544
Intention : Pensioner	-0.15935	0.28986	-0.550	0.5837
Intention : Homemaker	-0.34675	0.3324	-1.044	0.2992
Nursai : Unemployed with	0.42763	0.57376	0.745	0.4579
Nursai : Unemployed w/out	0.18834	0.68351	0.276	0.7835
Nursai : Pensioner	0.01505	0.4608	0.033	0.9740
Nursai : Homemaker	0.25286	0.49787	0.508	0.6127

Results of GLM of variables explaining intention to volunteer (AIC: 225.67)

Explanatory variable	Estimate	SE	t	p
Intercept	-0.14237	0.55876	-0.255	0.800
Attitude score	0.44379	0.33776	1.314	0.193
Direct PBC	0.34341	0.62605	0.549	0.585
Subjective norm	0.10527	0.61183	0.172	0.864
Unemployed with profession	-0.47576	0.85967	-0.553	0.581
Unemployed without profession	0.14287	0.71003	0.201	0.841
Pensioner	-0.17974	0.55120	-0.326	0.745
Homemaker	0.40041	0.96505	0.415	0.679
Nursai	-0.56479	0.63119	-0.895	0.374
Attitude : PBC	0.20074	0.17400	1.154	0.252
Attitude : Subj norm	0.28681	0.29667	0.967	0.337
Attitude : Unemployed with	-0.23294	0.27970	-0.833	0.407
Attitude : Unemployed w/out	-0.93160	1.19137	-0.782	0.436
Attitude : Pensioner	-0.35157	0.27217	-1.292	0.200
Attitude : Homemaker	-0.47286	0.30550	-1.548	0.126
Attitude : Nursai	0.13268	0.21930	0.605	0.547
PBC : Subj norm	-0.55005	0.62018	-0.887	0.378
PBC : Unemployed with	0.04181	0.23575	0.177	0.860
PBC : Unemployed w/out	-0.49460	0.56866	-0.870	0.387
PBC : Pensioner	0.58332	0.26239	2.223	0.029*
PBC : Homemaker	-0.00835	0.19927	-0.428	0.669
PBC : Nursai	-0.00835	0.17699	-0.047	0.962
Subj norm : Unemployed with	0.36129	0.85678	0.422	0.674
Subj norm : Unemployed w/out	-0.40503	1.14433	-0.354	0.724
Subj norm : Pensioner	-0.12689	0.55928	-0.227	0.821
Subj norm : Homemaker	-0.14508	0.98189	-0.148	0.883
Subj norm : Nursai	0.48135	0.65107	0.739	0.462
Nursai : Unemployed with	0.43775	0.41858	1.046	0.299
Nursai : Unemployed w/out	0.96012	0.95544	1.005	0.318
Nursai : Pensioner	0.48162	0.35990	1.338	0.185
Nursai : Homemaker	-0.16187	0.37843	-0.428	0.670

Results of GLM of variables explaining attitude towards volunteering (AIC: 262.36)

Explanatory variable	Estimate	SE	t	p
Intercept	0.6933	0.3890	1.782	0.0778.
Behavioural belief	0.1162	0.3559	0.327	0.7447
Unemployed with profession	-1.6933	0.8184	-2.069	0.0412*
Unemployed without profession	0.2738	0.6389	0.429	0.6692
Pensioner	-0.9580	0.5372	-1.783	0.0776.
Homemaker	0.0607	0.2480	-0.245	0.8072
Nursai	-0.9445	0.6702	-1.409	0.1619
Beh belief : Unemployed with	1.4838	0.8349	1.777	0.0786.
Beh belief : Unemployed w/out	-0.4768	0.6276	-0.760	0.4493
Beh belief : Pensioner	0.6191	0.5137	1.205	0.2311
Beh belief : Nursai	0.7232	0.6276	1.152	0.2520
Nursai : Unemployed with	0.3356	0.4256	.0789	0.4323
Nursai : Unemployed w/out	0.8565	0.6194	1.383	0.1699
Nursai : Pensioner	-0.1382	0.3785	-0.365	0.7159
Nursai : Homemaker	0.2790	0.4318	0.646	0.5197

Results of GLM of TPB variables explaining perceived behavioural control (AIC: 260.01)

Explanatory variable	Estimate	SE	t	p
Intercept	0.57580	0.19282	2.986	0.00358***
Control belief	0.34098	0.20091	1.697	0.09288.
Unemployed with profession	0.20111	0.29605	0.679	0.49856
Unemployed without profession	-0.31537	0.38408	-0.821	0.41360
Pensioner	0.02327	0.26245	0.089	0.92953
Homemaker	-0.57995	0.30733	-1.887	0.06214.
Nursai	-0.16587	0.26610	-0.623	0.53453
Control belief : Unemployed with	-0.45448	0.28759	-1.580	0.11729
Cont belief : Unemployed w/out	-0.55971	0.53451	-1.047	0.29765
Control belief : Pensioner	-0.22909	0.26343	-0.870	0.38664
Control belief : Homemaker	-0.74720	0.30282	-2.467	0.01536*
Contol belief : Nursai	-0.34382	0.21097	-1.630	0.10641
Nursai : Unemployed with	-0.37846	0.41698	-0.908	0.36633
Nursai : Unemployed w/out	-0.13625	0.57794	-0.236	0.81412
Nursai : Pensioner	0.26727	0.37571	0.711	0.47857
Nursai : Homemaker	-0.24666	0.42307	-0.583	0.56123

Results of GLM of variables explaining subjective norm (AIC: 77.454)

Explanatory variable	Estimate	SE	t	p
Intercept	0.88702	0.08432	10.520	<2e-16***
Normative belief	0.13726	0.10156	1.352	0.17964
Unemployed with profession	-0.61016	0.20623	-2.959	0.00388**
Unemployed without profession	-0.36580	0.21316	-1.716	0.08934.
Pensioner	0.08840	0.13876	0.637	0.52560
Homemaker	0.08154	0.12834	0.635	0.52666
Nursai	-0.31804	0.12092	-2.630	0.00993**
Norm belief : Unemployed with	0.41325	0.21877	1.889	0.06188.
Norm belief : Unemployed w/out	0.33091	0.24043	1.376	0.17189
Norm belief : Pensioner	-0.18014	0.14397	-1.251	0.21385
Norm belief : Homemaker	-0.20332	0.13973	-1.455	0.14888
Norm belief : Nursai	0.09548	0.11576	0.825	0.41153
Unemployed with : Nursai	0.48748	0.18842	2.587	0.0116*
Unemployed w/out : Nursai	0.27561	0.25795	1.068	0.28796
Pensioner : Nursai	0.08534	0.16684	0.511	0.61016
Homemaker : Nursai	0.33477	0.18483	1.811	0.07320.

Results of GLM of variables explaining willingness to help (AIC: 489.6)

Explanatory variable	Estimate	SE	t	p
Intercept	0.1764	0.22593	0.781	0.4362
Knowledge	0.37927	0.18312	2.071	0.0402*
Attitude	0.08977	0.19594	0.458	0.6476
Nursai	-0.09355	0.34894	-0.268	0.7890
Unemployed with profession	-0.42173	0.36647	-1.151	0.2518
Unemployed without profession	-0.24709	0.46651	-0.530	0.5972
Pensioner	-0.80517	0.33549	-2.400	0.0177*
Student	-0.90757	0.81726	-1.111	0.2687
Homemaker	-0.38960	0.10976	-0.951	0.3433
Attend SD	0.58945	0.75237	0.783	0.4347
Knowledge : Nursai	0.10933	0.16922	0.646	0.5193
Knowledge : Unemployed with	-0.21176	0.27736	-0.763	0.4465
Knowledge : Unemployed w/out	0.02042	0.63952	0.032	0.9746
Knowledge : Pensioner	0.48226	0.27831	1.733	0.0853.
Knowledge : Student	-1.40839	1.86925	-0.753	0.4525
Knowledge : Homemaker	-0.71403	0.34986	-2.041	0.0431*
Knowledge : Attend SD	0.81825	1.8582	0.440	0.6604
Nursai : Unemployed with	0.51405	0.60825	0.845	0.3995
Nursai : Unemployed w/out	0.65169	1.00290	0.650	0.5169
Nursai : Pensioner	-0.35271	0.53915	-0.654	0.5141
Nursai : Student	0.28031	0.44277	0.633	0.5277
Nursai : Homemaker	0.08698	0.60771	0.143	0.8864
Knowledge : Attitude	-0.04498	0.09857	-0.456	0.6488
Attitude : Nursai	0.14664	0.18190	0.806	0.4215
Attitude : Unemployed with	0.09695	0.28162	0.344	0.7311
Knowledge : Unemployed w/out	-0.01490	0.50560	-0.029	0.9765
Attitude : Pensioner	0.04342	0.28277	0.154	0.8782
Attitude : Student	-0.00769	0.21843	-0.035	0.9719
Attitude : Homemaker	-0.37487	0.29336	-1.278	0.2034

Results of GLM of variables explaining attitude towards conservation of the steppe (AIC: 496.2)

Explanatory variable	Estimate	SE	t	p
Intercept	-0.12965	0.23220	-0.558	0.577
Knowledge	0.07760	0.18460	0.420	0.675
Nursai	0.35752	0.35744	1.000	0.319
Unemployed with profession	0.17876	0.37991	0.471	0.639
Unemployed without profession	-0.00303	0.48003	-0.006	0.995
Pensioner	0.26146	0.34528	0.757	0.450
Student	-0.47968	0.83948	-0.571	0.569
Homemaker	-0.52918	0.39694	-1.318	0.190
Attend SD	0.54783	0.77139	0.710	0.479
Knowledge : Nursai	0.01019	0.16245	0.063	0.950
Knowledge : Unemployed with	0.16720	0.28251	0.592	0.555
Knowledge : Unemployed w/out	0.44939	0.61126	0.735	0.463
Knowledge : Pensioner	-0.27014	0.27940	-0.967	0.335
Knowledge : Student	-1.58632	1.89849	-0.836	0.405
Knowledge : Homemaker	-0.14510	0.36298	-0.400	0.690
Knowledge : Attend SD	1.77992	1.88724	0.943	0.347
Nursai : Unemployed with	0.25951	0.60846	0.426	0.670
Nursai : Unemployed w/out	0.73196	0.88921	0.823	0.412
Nursai : Pensioner	-0.07961	0.54809	-0.145	0.885
Nursai : Student	-0.17047	0.45403	-0.375	0.708
Nursai : Homemaker	-0.14067	0.6224	-0.226	0.822

Results of GLM of variables explaining knowledge of the steppe (AIC: 677.55)

Explanatory variable	Estimate	SE	t	p
Intercept	0.4500	0.2105	2.138	0.03364*
Nursai	-0.9169	0.3147	-2.913	0.00394**
Unemployed with profession	-0.5187	0.3590	-1.445	0.14995
Unemployed without profession	-0.2610	0.4465	-0.584	0.55951
Pensioner	0.0330	0.3099	0.106	0.91529
Student	0.2965	0.2631	1.127	0.26090
Homemaker	-0.9442	0.3404	-2.774	0.00601**
Attend SD	0.6137	0.3054	-2.009	0.04571*
Nursai : Unemployed with	0.4996	0.5626	0.888	0.37550
Nursai : Unemployed w/out	0.2239	0.7512	0.298	0.76592
Nursai : Pensioner	1.0218	0.5041	2.027	0.04385*
Nursai : Student	-0.6745	0.3943	-1.711	0.08853.
Nursai : Homemaker	0.6552	0.5707	1.148	0.25219
Nursai : Attend SD	1.3227	0.4631	2.856	0.00469**

Results of GLM of variables children's willingness to help (AIC: 162.06)

Explanatory variable	Estimate	SE	t	p
Intercept	-0.33674	0.52222	-0.645	0.5227
Knowledge	0.15383	0.39862	0.386	0.7016
Attitude	-0.66518	0.37788	-1.760	0.0860.
Non-member	-0.53283	0.50143	-1.063	0.2943
Nursai	0.65642	0.46960	1.398	0.1699
Male	0.26900	0.68245	0.394	0.6955
Knowledge : Attitude	0.10444	0.19542	0.534	0.5960
Knowledge : Non-member	-0.82037	0.44630	-1.838	0.0735.
Knowledge : Nursai	0.00169	0.29978	0.006	0.9955
Attitude : Non-member	1.03613	0.40485	2.559	0.0144*
Attitude : Nursai	0.20858	0.35729	0.584	0.5626
Attitude : Male	-0.07039	0.31019	-0.227	0.8216
Knowledge : Male	0.58329	0.33088	1.763	0.0856.
Nursai : Male	-0.55106	0.65785	-0.838	0.4072
Non-member : Male	0.26509	0.86240	0.307	0.7601

Results of GLM of variables explaining children's attitude towards the steppe (AIC: 165.01)

Explanatory variable	Estimate	SE	t	p
Intercept	0.14116	0.68305	0.207	0.8372
Knowledge	0.16353	0.46457	0.352	0.7265
Non-member	0.53245	0.92747	0.574	0.5688
Nursai	0.36144	0.68558	0.527	0.6007
Male	0.16224	0.73498	0.221	0.8263
Non-member : Nursai	-0.96719	0.91129	-1.061	0.2943
Non-member : Male	-1.35002	0.96111	-1.405	0.1671
Knowledge : Non-member	0.33105	0.42312	0.782	0.4382
Knowledge : Male	-0.35403	0.33838	-1.046	0.3012
Knowledge : Nursai	-0.09037	0.344	-0.262	0.7942
Nursai : Male	1.13405	0.65602	7.729	0.0909

Results of GLM of variables explaining children's knowledge of the steppe (AIC: 255.75)

Explanatory variable	Estimate	SE	t	p
Intercept	0.53784	0.29104	1.848	0.0680.
Non-member	-0.80685	0.35582	-2.268	0.0259*
Nursai	-0.00239	0.41005	0.006	0.9954
Male	0.35750	0.39931	0.895	0.3731
Non-member : Nursai	-0.14465	0.46972	-0.308	0.7589
Non-member : Male	-0.13748	0.45930	-0.299	0.7654