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TITLE:

Trialling the Theory of Change approach to impact evaluation in conservation using the Saiga Conservation Alliance's work in Uzbekistan as a case study

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Abstract

There is a need for high quality impact evaluation in conservation biology. In response to this need there is a growing body of work on how best to evaluate conservation interventions. However, often these methods are often too time consuming or resource heavy for small NGOs to carry out. I trialled the Theory of Change of approach to impact evaluation using the Saiga Conservation Alliance's work in Uzbekistan as a case study. I used the approach to construct diagrammatic representations of the Theories of Change focusing on the threat of oil and gas companies and poaching to vulnerable populations of saiga antelope (*Saiga tatarica)* on the Ustyurt plateau. I used these Theory of Changes and the relevant assumptions and accompanying evidence as part of an evaluation plan to set priorities for monitoring and data collection. The results showed that The Theory of Change approach is a useful and insightful one that is suitable for small NGOs to use in impact evaluation. It was also revealed that the approach holds lots of potential for future use by the Saiga Conservation Alliance and more broadly in the field of conservation as a powerful tool for planning, communication and evaluation.

Introduction

1. Why we need impact evaluation in conservation biology

Globally, approximately US$ 7- 10 billion is invested annually in biodiversity conservation (IUCN 2010). However, this amount is not sufficient to tackle the very large task of conserving this planet's dwindling biodiversity. The Convention on Biological Diversity (CBD) estimates that the funding gap to achieve its three global objectives is US$10 to 50 billion per year (IUCN 2010). It's clear from these figures that the money invested into conservation is a limited and precious resource and so conservationists are morally and practically obliged to invest money in the most cost effective way. There is also increasing pressure from donors that project success is demonstrable (Washington et al. 2014). Therefore, impact evaluation is a necessity in conservation science. Impact evaluation aims to demonstrate that programme interventions or activities lead to their intended results (Stern 2015).

Conservation is behind other fields, such as health and ecology, in terms of both quantity and quality of evaluations (Howe and Milner-Gulland 2012). Intuition and anecdote are too heavily relied upon in the design of conservation interventions (Ferraro and Pattanayak 2006). Conservationists must be able to demonstrate measurable and attributable impacts of their actions (Margoluis et al. 2013). As well as the focus on attribution, there is increasing emphasis on explanation – the how and why of impacts. This aspect of evaluation is needed for lesson learning within and between organisations.

2. Different approaches to impact evaluation

A spectrum of different approaches to impact evaluation exist. Each approach has different requirements, strengths and weaknesses and it is important that organisations choose an approach that is feasible and suitable to their needs. For example, recently in conservation literature there has been a focus on experimental and quasi-experimental design and the use of counterfactuals in the design of evaluation methods (Woodhouse et al. 2016). An alternative design type is statistical design. Approaches such as statistical modelling and longitudinal studies which fall

into this design category require a large sample size, comparison groups or longitudinal data, and data on confounding factors (Stern 2015). The problem with statistical and experimental approaches to impact evaluation is that they are often not feasible for small conservation organisations to use. Typically, real-life conservation projects operate in contexts that are dynamic and complex and under conditions of limited resources, meaning that these design types are often unsuitable.

An alternative approach is a theory based evaluation. This type of evaluation follows a logical sequence of cause and effect linkages in which the evaluation explores the extent to which events followed the anticipated sequence and the intervention achieved the desired objective. One of the benefits of these designs are that they do not require the use of control. This means that they are particularly useful when comparative groups cannot be identified. Although this tends to make them weak on estimating the quantity or extent of an impact, they are strong on explaining how and why interventions or activities lead to specified outcomes. Theory based evaluation relies on the development of an adequate Theory of Change.

3. What is Theory of Change?

The simplest way to define a Theory of Change (ToC) is as "a theory of how and why an initiative works" (Weiss, 1995). More fully articulated, this can be understood as a way to describe the set of assumptions that explain both the mini-steps that lead to a long-term goal and the connections between these activities and the outcomes of an intervention or programme (Stein and Valters 2012). However, defining Theory of Change (ToC) can be tricky because it is both a process and a product (Vogel 2012).

The ToC process is a theory based approach to planning, implementing or evaluating change at an individual, organisational or community level (Laing and Todd 2015). The idea of the ToC process seems to have first emerged in the United States in the 1990s, in the context of improving evaluation theory and practice in the field of community initiatives (Stein and Valters 2012). The approach is starting to be used in conservation and there is potential for it to be used as an impact evaluation approach in this field.

If seen as an on-going process of discussion-based analysis and learning, the ToC approach has the potential to provide powerful insights to support programme design, strategy, implementation, evaluation and impact assessment. The approach is communicated through diagrams and narratives which are updated at regular intervals. (Vogel 2012) These diagrams and narratives are the product of the ToC approach which are also referred to as ToCs themselves. ToCs may be developed and used at various points in the lifecycle of an initiative or programme, from planning an idea through to implementation, delivery and review (Stein and Valters 2012).

4. Project aim and objectives

There is a need for robust and efficient methods to evaluate the ongoing impact of the work of conservation organisations. This is especially important for small NGOs where resources, both time and money, are often very limited. The aim of this project is to test the suitability of the ToC approach to impact evaluation in a small NGO such as the Saiga Conservation Alliance (SCA). This project will use the SCA as a case study and will focus on the SCA's work in Uzbekistan.

Project objectives:

1. To develop ToCs for the SCA's work in Uzbekistan.
2. To critically examine the evidence for the assumptions underlying the theorised ToC pathways.
3. To identify key areas of uncertainty and provide recommendations based on this analysis for research and monitoring.
4. To reflect on the process and summarise potential application of the approach to the SCA's future work.

5. The study system

The Saiga Conservation Alliance

The SCA is a network of researchers and conservationists who have worked together for over 15 years to study and protect the critically endangered saiga antelope. It is a small UK-based charity that carries out work in Kazakhstan, Uzbekistan, Russia, Mongolia, China and the UK alongside many other NGOs, government and academic bodies.

The saiga antelope

The saiga antelope (*Saiga tatarica*) is a migratory antelope that is listed as Critically Endangered by the IUCN. In the present day there are two sub-species: *Saiga tatarica tatarica* and *Saiga tatarica mongolica*. *Saiga tatarica tatarica* is found in 4 sub-populations in Kazakhstan, Russia, and Uzbekistan and *Saiga tatarica mongolica* is found in Mongolia (Lundervold 2001). The fall in saiga populations has been drastic. In the early 1990s numbers were over a million, but were estimated to be just 6% of that by 2005 (SCA 2016). The primary reason for this rapid decline has been ascribed to poaching (Milner-Gulland et al. 2001). The saiga is a culturally and ecologically important species of the steppe ecosystem (Sazazova and Blau 2013). Their seasonal grazing of steppe regions maintains vegetation compositions and increases the fertility of soil (Milner-Gulland et al. 2001). The antelope also serves as an important prey species for wolves, foxes and several raptor species (Milner-Gulland et al. 2001).

Figure 1: Map showing the range of saiga antelope and the approximate range of each of the populations. 1 Kalmykia, 2 Ural, 3 Ustyurt, 4 Betpak-dala, 5a and 5b Mongolia. (Milner-Gulland et al. 2001)

The Ustyurt population

The SCA's team in Uzbekistan is primarily concerned with conserving the Ustyurt population which inhabits the Ustyurt Plateau (see figure 2 and 3). This is a region of temperate desert approximately 200,00km^2 in size. The Ustyurt Plateau spans across the border of Uzbekistan into Kazakhstan and the saiga population is trans-boundary and migrates from Kazakhstan to Uzbekistan in winter.

Figure 2: Map of the Uzbekistan Ustyurt (Offord, 2011). Red lines demarcate the country border; solid grey lines indicate road; black and grey lines indicate railway lines and red dots show the locations of settlements.

Figure 3: Map showing the location of saiga sightings (dark blue cirlces) between 2006 and 2012 on the Uzbekistan Ustyurt. Green lines indicate road; blue lines indicate railway and red circles show the location of settlements (Marsden 2012)
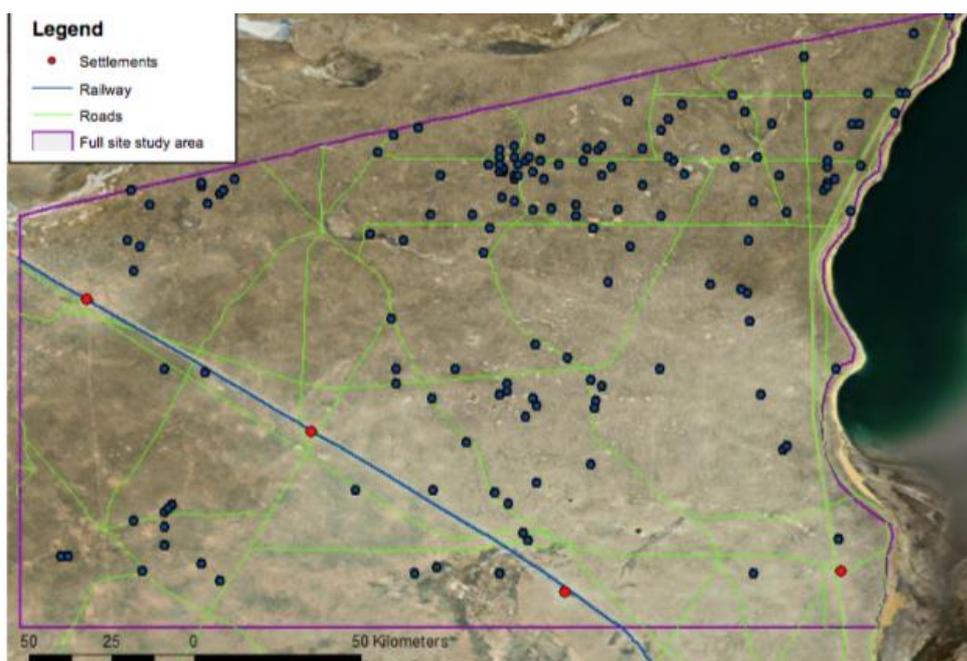
From the 1920s up until the collapse of the Soviet Union in 1991 Uzbekistan was under Soviet rule. During Soviet rule the state strictly controlled hunting and saigas were not a threatened species in Uzbekistan. But with the collapse of the Soviet Union and subsequent economic crisis hunting of saigas has risen dramatically (Külh et al. 2009). The effect of this rise in hunting is evident in figure 4 which shows the decline of the Ustyurt population from 265,000 in 1989 to less than 2000 in 2016. Saigas in Uzbekistan are under serious threat of extinction. Currently poaching is considered the main threat to saigas in this region but other threats exist and are summarized in table 1.

Figure 4: Graph of the transboundary Ustyurt saiga population size by year based on data from Milner- Gulland 2001 and CMS 2016
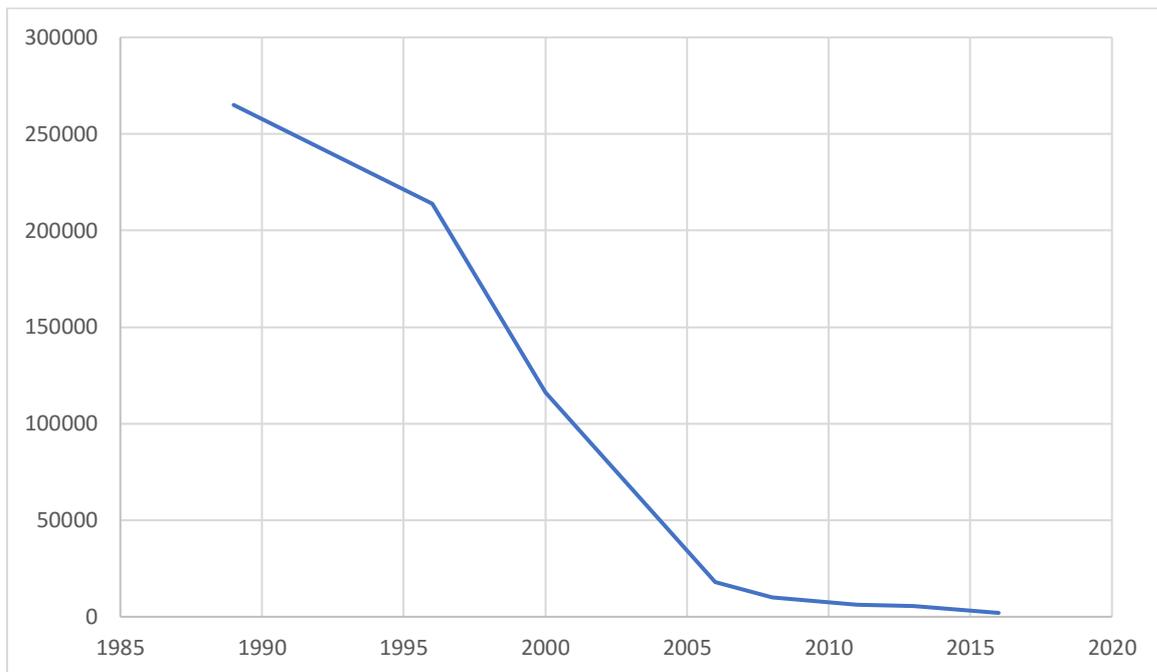
Table 1: summary of threats to Ustyurt population

Threat	Comments
Poaching	The primary threat to saigas range-wide (except in Mongolia) is widely recognised as poaching (Kühl et al., 2009). Saigas are poached both for their meat and their horns. Saiga horn is highly prized in traditional Chinese medicine and one kilogram of horn yields US$370 to US$550 (SCA 2013). Saiga meat is also sold and eaten in communities in Uzbekistan (Phillipson & Milner-Gulland, 2011).
Border fence	A high, barbed wire fence (see figure 5) was built along the border between Kazakhstan and Uzbekistan on the Ustyurt plateau in 2012 (SCA 2014). Data collected from satellite collars has shown that the fence has created a barrier for migration (see figure 6). In response to pressure from conservation organisations some actions have since been taken to allow animals to migrate more freely. These include creating passages by removing the lower wires of the fence at one-kilometre intervals over parts of the fence (SCA 2015).
Oil and gas	The estimated reserves of gas in Uzbekistan are 2.44 trillion cubic m, of which 1.7 trillion cubic m is deposited in the Ustyurt Plateau. (SCA 2006) To develop gas deposits pipelines, gas-compressor stations and industrial sites must all be constructed. This leads to destruction and fragmentation of habitats, an increase in noise and chemical contamination, and degradation of vegetation and soil cover (SCA 2008). The growing interest of the extractive industries means that oil and gas is increasingly becoming a threat to saigas on the Ustyurt. There's currently a new railway and pipeline planned across the range of the Ustyurt population (see figure 7).

Figure 5: Border fence between Kazaksthan and Uzbekistan. The fence is 170m high with 20cm gaps between the barbed wire (Zuther, 2013)

Figure 6: Map showing the movements of collared saiga at the border between Kazakhstan and Uzbekistan at the Ustyurt Plateau from January 2012 to May 2013 (Zuther, 2013)
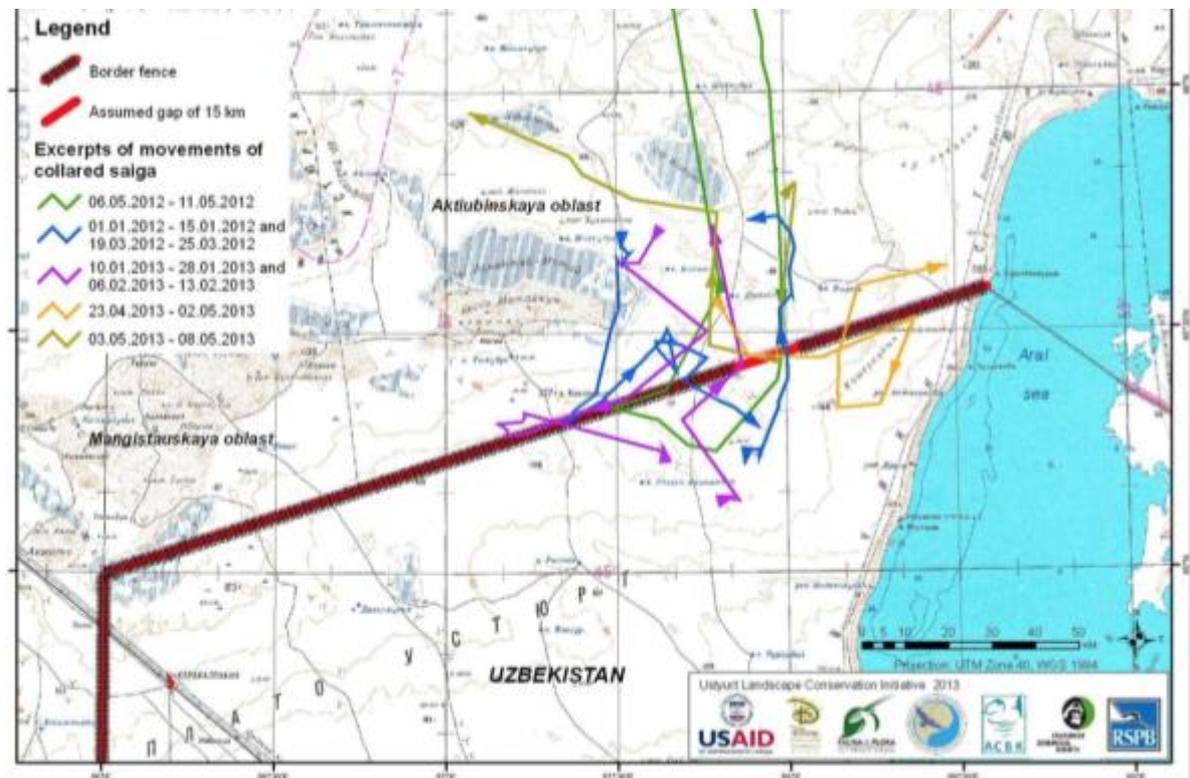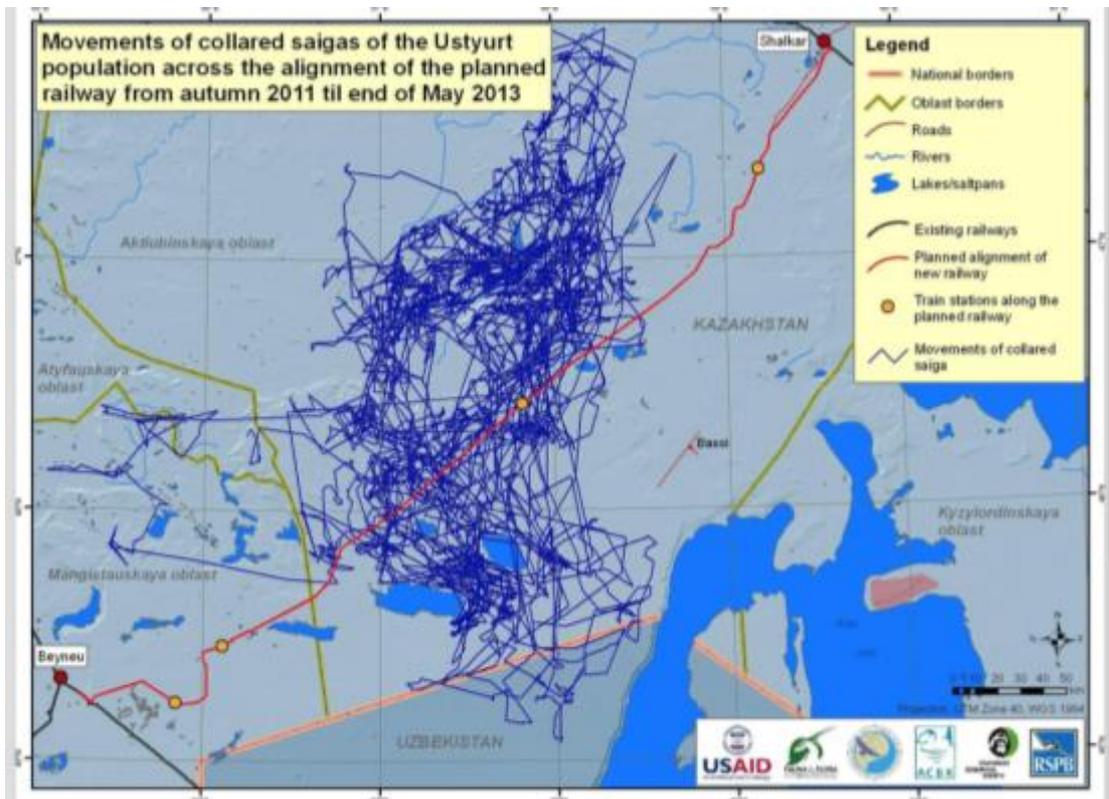
Figure 7: Map showing how the planned train line will intersect the movement of saigas across the Ustyurt plateau (Zuther, 2013)

Methods

1. Process of developing a Theory of Change

Throughout the available literature on ToCs there is not a single agreed process of developing a ToC. However, there tends to be agreement that the process of articulating ToCs should include the participation of a wide range of stakeholders and should be based on a variety of forms of rigorous evidence (Stein and Valters 2012). There is also a consensus that the process is iterative and a ToC is intended to be an evolving tool, and a set of theories relevant to a specific setting, that is articulated, tested, and improved over time.

The ToCs created for the SCA's work in Uzbekistan were created through collaboration between academic research and practice expertise (perspectives and feedback from experts were collected by interviewing).

The ToC was then used as a framework for guiding an evaluation of the SCA's work in Uzbekistan. This involved making critical judgements about our confidence in our assumptions and using this analysis, along with our ToCs, to prioritise the reduction of our uncertainties and make evaluation recommendations for the SCA.

2. Conducting a literature review

The first stage of the process was conducting a thorough literature review. I reviewed a wide range of reports, examples and guides on ToC approaches to decide the best possible way of developing the approach to meet the objectives of this project. Next I reviewed a variety of literature focusing on saigas, saiga conservation and conservation in Uzbekistan. This included all published issues of the Saiga News (the SCA's comprehensive newsletter which shares developments in saiga conservation and ecology), SCA strategic plans and reports and action plans published by the Convention of Migratory Species. I also reviewed scientific papers and journals focusing on the threats and drivers of saiga population decline. Information gathered from this review was used to design interview guides and construct the ToCs.

3. Conducting interviews

I undertook a series of interviews during which members of the project team articulated information that would help construct the ToCs. This included:

- Their views on the main threats to saigas that needed to be addressed in Uzbekistan
- Current and potential interventions to address these threats
- Potential barriers to success

The Uzbekistan project team is small as is often the case with small NGOs where expert knowledge and experience is held by only a few. The interviews were semi-structured and each followed a pre-designed interview guide. Views gathered from these interviews were used along with wider research to create diagrams that were discussed and modified until a consensus was reached about a coherent, workable and measurable ToC.

4. Constructing a Theory of Change

Components of a Theory of Change

A ToC typically functions according to a sequential logic that runs from:

- **Activities:** specific actions undertaken to mitigate a threat or support an opportunity.
- **Outputs:** the immediate and measurable products of the activities of an intervention.
- **Outcomes:** the intermediate result that is brought about by producing preceding project outputs.
- **Impacts:** The wider and longer term effects of an intervention and the contribution the intervention makes to broader goals.

Figure 8: Diagram of the sequential components of a ToC
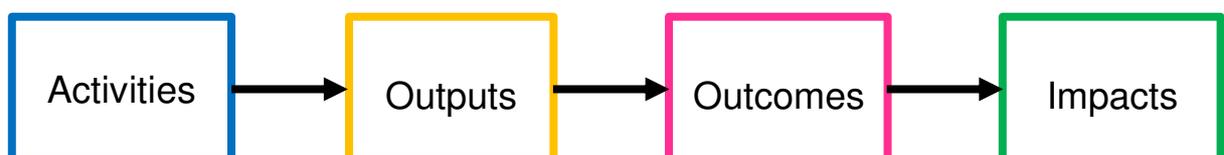
This pathway is underpinned by a series of assumptions which need to be articulated.

- **Assumptions:** Statements that explain both the connection between preconditions for long-term change that occur in the early and intermediate stages of the change process, and the expectations about how and why proposed interventions will bring them about.

Situational analysis

A ToC should begin with a good situational analysis (Rogers 2014). This involves identifying the problem that the project is seeking to address and the causes of this problem. In the case of Uzbekistan the problem that the SCA project team is trying to address is the rapidly declining Ustyurt saiga population. In order to understand the causes of this problem we have to look at what is threatening saigas. The main threats to saigas were originally identified through a review of published literature. These findings were then discussed with the project team during the interview process.

Once the threats have been identified the next stage is to decide which threats to focus the ToC approach on. Threats were chosen that were:

- Relevant to Uzbekistan – as this is where this project is focussed.
- Significant – as addressing small threats will not have a large impact if there are other more significant threats present.
- Realistic – the threat must be something you believe can be successfully addressed within the scope of your approach.

Interviews with the project team revealed that not all of the threats originally identified were directly relevant to saigas in Uzbekistan, and so were eliminated from our approach. The remaining threats: oil and gas, poaching and border fence (see table 1 in introduction) were all deemed significant (due to their scope and severity). But only oil and gas and poaching were considered realistic to address with this approach. The border fence is a significant threat but, aside from the modifications that have already taken place there, feedback from the project team suggests that

there is currently little more the SCA can do to further mitigate this threat. Therefore, the threats chosen to focus on in this ToC approach were oil and gas and poaching.

<u>Expressing desired impacts</u>

The next step is to make explicit the impacts that the project seeks to produce. To address the problem of declining saiga numbers in Uzbekistan we need to focus our impacts on addressing the main threats to saigas. Therefore, we can define our desired impacts as:

    1) Decreased pressure on saigas from poaching

    2) Decreased pressure on saigas from oil and gas companies

<u>Creating an outcomes framework</u>

This step involves the identification and organisation of all outcomes, outputs and inputs necessary to achieve the desired impacts defined in the previous step (Conservation International 2013). This is done by a process called "backwards mapping" where you start at the end of the project, imagining the successful achievement of your desired impacts, and work backwards to decide what preconditions are required at each stage (Conservation International 2013).

This process was repeated twice for each of our desired impacts. This was the most time-intensive step in constructing the ToCs as throughout the process outcomes are added, moved and deleted and the framework goes through many revisions until a consensus is reached about a coherent ToC.

<u>Articulating assumptions</u>

The next stage is to make the assumptions that underpin each step of our framework explicit. Assumptions explain the underlying logic behind our expectations of the connections between different components of the pathway of change. Assumptions should tell the story about how and why we expect change to occur as depicted in the outcomes framework (Conservation International 2013). Ideally assumptions should be supported by scientific research, best practices or expert knowledge. It is

also possible to test assumptions with field research, depending on funding and time constraints. Our assumptions were based on:

- o Anecdotal evidence from the project team (collected during interviews)
- o Evidence from literature published on saigas
- o Evidence from wider published literature

5. Using Theory of Change to guide evaluation

Assessing strength of assumptions

Next we can assess the strength of our assumptions by reviewing the evidence for each assumption. A judgement needs to be made on how confident we can be in our assumptions based on the evidence. I chose to categorise each assumption to one of three levels of confidence: high, medium or low. Criteria for assignment to each category is summarised in table 2.

Table 2: levels of confidence in our assumptions and the criteria showing what evidence is required for each category

Level of confidence	Criteria
Low	No supporting evidence; only weak anecdotal evidence e.g. only one individual case; contradicting evidence
Medium	Supporting evidence in literature but only one source; some anecdotal evidence, assumptions based on theories tested in wider literature but not in the field of saiga conservation
High	Strong anecdotal evidence; supporting evidence from several sources from saiga literature; supporting evidence sources from both saiga literature and wider literature

Prioritising reduction of uncertainty

Next we can attempt to prioritise the reduction of our uncertainties. This requires coming back to our ToCs and for each one making an assessment of which links or

pathways in the chain are most fundamental or important. Then we look at the strengths of our assumptions along these pathways which allows us to see where the biggest gaps in information are and where filling these gaps is most important. This allows us to identify priorities for research and monitoring.

Results

1. Theory of Changes

<u>Oil and gas ToC</u>

This ToC focusses on the theorised pathway to decreasing the pressure on saigas from oil and gas companies. The activities (blue), outputs (orange), outcomes (pink) that are required to reach this impact (green) are mapped out in figure 9. This ToC hypothesises that to achieve the desired impact the focus should be on three main outputs: avoiding most vulnerable areas, mitigating damage by using best practice methods and carrying out compensation for damage that is already done and that is unavoidable.

For simplicity activities are described generally and more details of the specific interventions that the SCA has in place are described in appendix B. For this ToC the SCA has interventions that align with all of our hypothesised actions.

The assumptions in each link of the ToC pathway are indicated by a code (A1, A2, A3…) in order to simplify the diagram. Descriptions of the assumptions can be found in table 3.

Figure 9: ToC developed for decreasing pressure on saigas from oil and gas companies. A indicates and assumption underlying the pathway

Key:
Inputs
Outputs
Outcomes
Impact
Assumptions
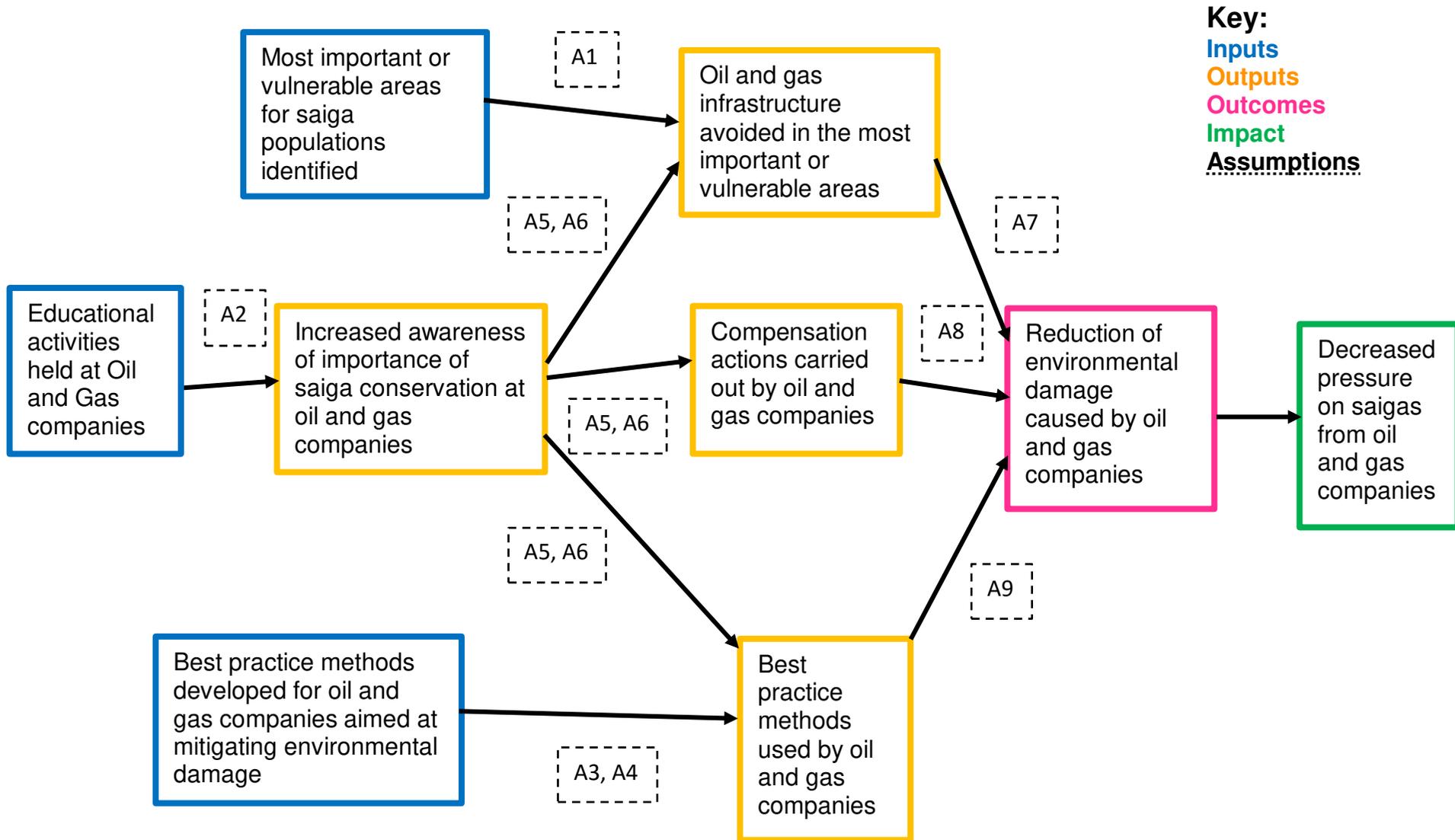
<u>Poaching ToC</u>

Figure 10 is the diagrammatic representation of the ToC focused on the desired impact of decreasing pressure on saigas from poaching. It shows the hypothesised pathway of 9 identified actions (blue) that lead to three main outcomes (pink). The outcomes framework that details the pathway from actions to outcomes is too complicated to be represented in one diagram. Instead, the actions have been grouped into four pathways (purple) and each pathway is represented in its own, more detailed diagram (see fig.11, 12 and 13). Assumptions are not indicated on the overall ToC but are indicated on the individual pathway diagrams.

Figure 10: Overall ToC developed for decreasing pressure on saigas from poaching.

Key:
Pathway
Inputs
Outcomes
Impact

Pathway 1
- I4: Strong anti-poaching role models in law enforcement celebrated in communities
- I5: Provide support for interagency cooperation
- I6: Provide equipment for law enforcement
- I7: Provide training for law enforcement

See fig. 12 for details of pathway

Pathway 2
- I8: Educational activities and community events held in villages

See fig. 13 for details of pathway

Pathway 3
- I9: Campaign to raise awareness of illegality and discourage consumption of saiga meat
- I10: Educational activities

See fig. 14 for details of pathway

Pathway 4
- I11: Involve community in participatory monitoring
- I12: Support existing or develop new livelihood programmes

See fig. 15 for details of pathway

Strengthen disincentives for poaching

Weaken incentives for poaching

Increased incentive to protect wildlife

Reduction in poaching

Decreased pressure on saigas from poaching

Pathway 1: decreasing pressure on saigas from poaching via support for law enforcement

Pathway 1 (fig.11) hypothesises that support for and strengthening of law enforcement will increase with the disincentives to poaching and ultimately reduce poaching.

SCA interventions which correspond with the activities outlined in this pathway can be found in appendix B. For this ToC pathway the SCA has interventions aligned with all of the actions apart from providing equipment for law enforcement. This is because the Uzbekistani government's procurement rules prevent the SCA from providing equipment to rangers and local law enforcement.

The assumptions in each link of the ToC pathway are indicated by a code (A1.1, A1.2, A1.3…) in order to simplify the diagram. Descriptions of the assumptions can be found in table 4.

Figure 11: Pathway 1 of Theory of Change developed for decreasing pressure on saigas from poaching via support for law enforcement
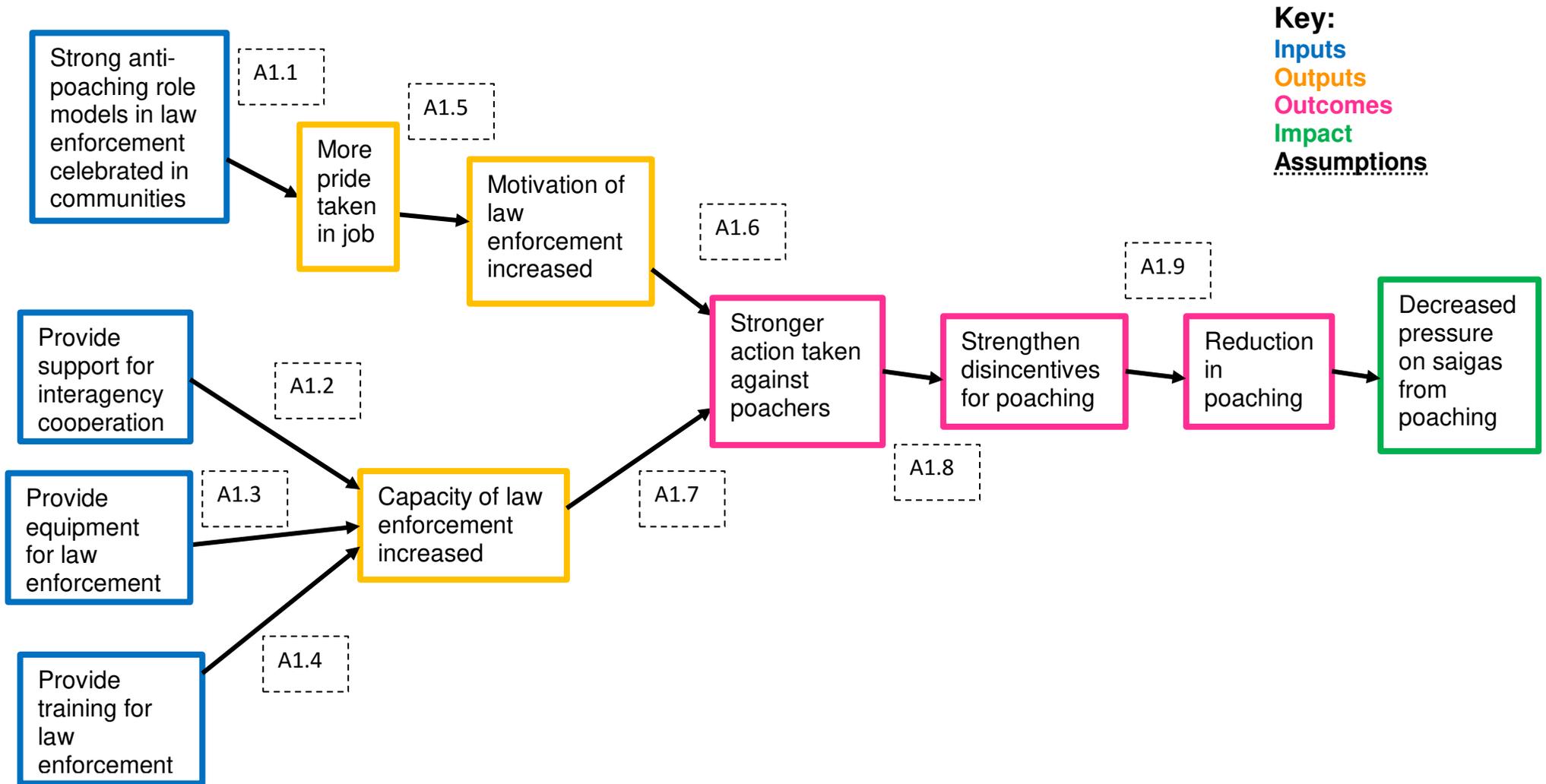
Pathway 2: decreasing pressure on saigas from poaching via changing social norms towards poaching

Pathway 2 (fig.12) also hypothesises ways to strengthen disincentives for poaching but focuses instead on changing communities' attitudes towards poaching. Pathway 2 also shows a positive secondary outcome that does not directly lead to our desired impact but leads to increased cooperation between communities and the SCA, which then feeds indirectly into other pathways.

SCA interventions which correspond with the activities outlined in this pathway can be found in appendix B. For this ToC pathway the SCA has a large array of corresponding interventions, most of which fall under the umbrella of Project CEU-2 "Saiga education".

The assumptions in each link of the ToC pathway are indicated by a code (A2.1, A2.2, A2.3…) in order to simplify the diagram. Descriptions of the assumptions can be found in table 5.

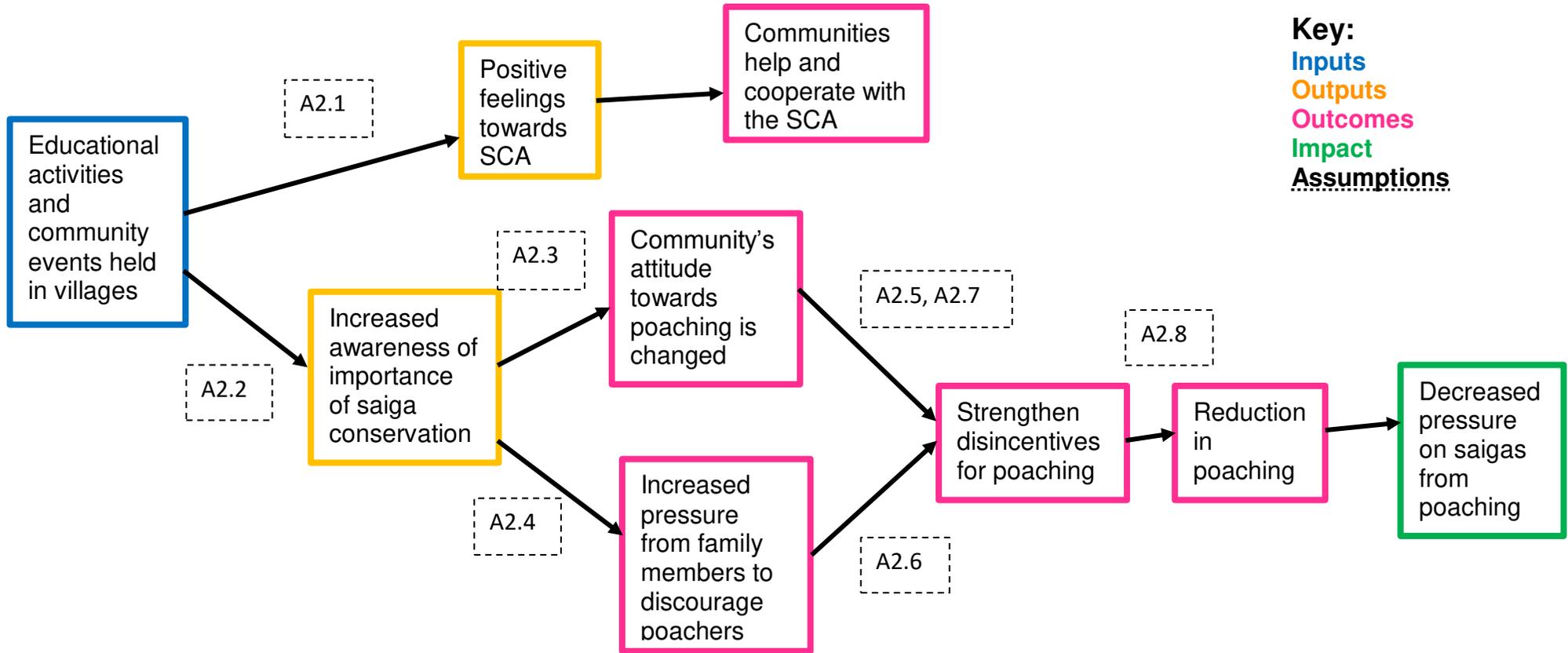Figure 12: Pathway 2 of Theory of Change developed for decreasing pressure on saigas from poaching via changing social norms towards poaching

<u>Pathway 3: for decreasing pressure on saigas from poaching via changing attitudes towards meat consumption in communities</u>

Pathway 3 (fig.13) hypothesises that changing attitudes towards saiga meat consumption in both rural and urban communities will decrease the incentives to poaching and ultimately reduce poaching.

SCA interventions which correspond with the activities outlined in this pathway can be found in appendix B. There is no current SCA intervention that corresponds with the action of campaigning to raise awareness of illegality and discourage the consumption of saiga meat. This action is primarily focused on addressing the demand for saiga meat from urban communities, which is a relatively new demand.

The assumptions in each link of the ToC pathway are indicated by a code (A3.1, A3.2, A3.3…) in order to simplify the diagram. Descriptions of the assumptions can be found in table 6.

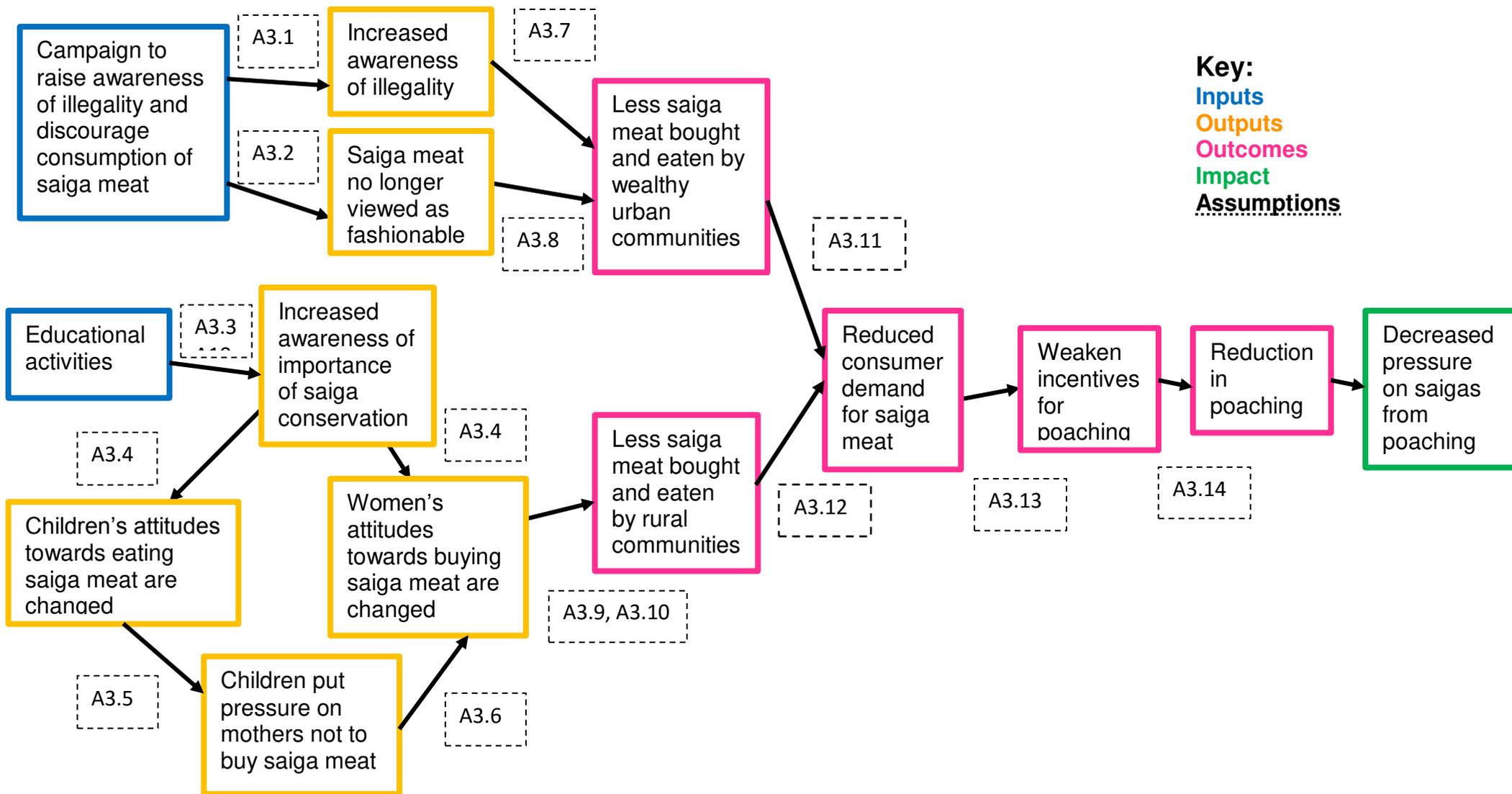Figure 13: Pathway 3 of Theory of Change developed for decreasing pressure on saigas from poaching via changing attitudes towards meat consumption in communities

<u>Pathway 4: decreasing pressure on saigas from poaching via supporting alternative livelihoods</u>

Pathway 4 (fig.14) hypothesises that development of new and support for current alternative livelihoods will weaken incentives to poaching and that involving communities in participatory monitoring will ultimately increase their incentive to protect wildlife.

SCA interventions which correspond with the activities outlined in this pathway can be found in Annex B. For this ToC pathway the SCA has interventions aligned with all of the actions.

The assumptions in each link of the ToC pathway are indicated by a code (A4.1, A4.2, A4.3…) in order to simplify the diagram. Descriptions of the assumptions can be found in table 7.

Figure 14: Pathway 4 of Theory of Change developed for decreasing pressure on saigas from poaching via supporting alternative livelihoods
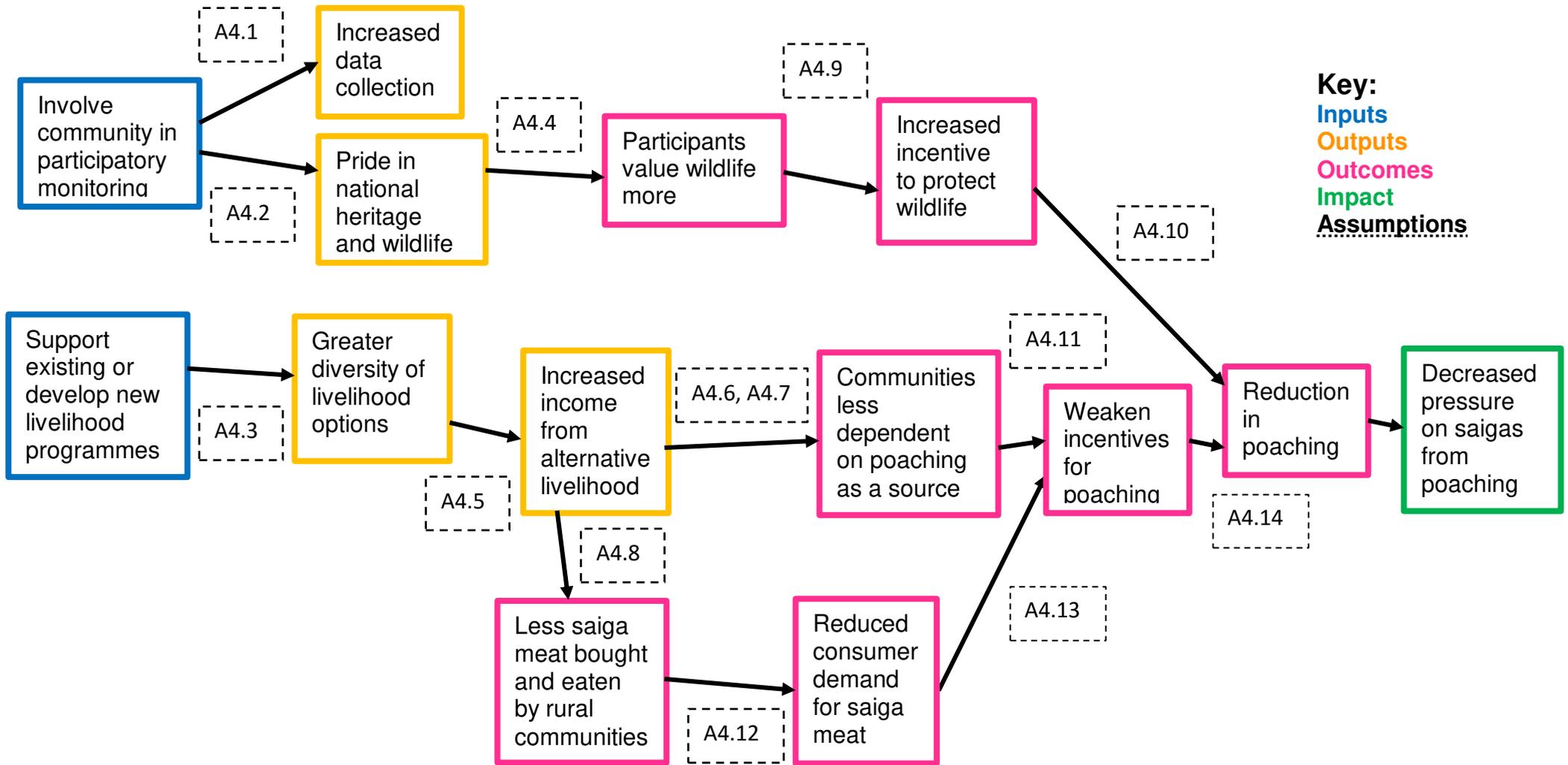
2. Assumptions

The assumptions which underpin our poaching and oil and gas ToCs are made explicit in the tables below. Evidence on which these assumptions are based can be found in appendix A. Using this evidence each assumption has been categorised into one of three levels of confidence: low, medium or high.

Table 3: Assumptions from oil and gas ToC and corresponding level of confidence

Code	Assumption	Level of confidence
A1	There are alternative areas for oil and gas extraction and there is no financial or other distinctive for avoiding most vulnerable and important areas	Low
A2	Participants leave educational events with increased knowledge	Medium
A3	There is no financial or other disincentive to using environmentally friendly best practice methods	Low
A4	Transition between old methods and best practice methods is relatively easy	Low
A5	Increased awareness of government and businesses leads to an attitude change and a motivation to reverse and minimize environmental damage	Medium
A6	Correct people who can implement change are reached	High
A7	No other activities that damage the environment take place instead of oil and gas activities	High
A8	Compensation actions contribute to a reversal in environmental damage	High
A9	Best practice methods mitigate environmental damage	High

There is a high level of confidence for the assumptions linking outputs to outcomes in this ToC (A7, A8 and A9). This means that we can be confident that our outputs

will lead to our desired outcome of reducing environmental damage from oil and gas companies. However, for the assumptions that link activities to outputs in this ToC there is a much lower level of confidence (A1, A2, A3 and A4). These assumptions need to be tested if we are to be confident that proposed activities will lead to the necessary outputs.

Table 4: Assumptions from pathway 1 of poaching ToC and corresponding level of confidence

Code	Assumption	Level of confidence
A1.1	People care about the opinions of their communities	High
A1.2	Interagency cooperation is helpful to law enforcement	High
A1.3	Better trained and equipped guards do not use their advanced equipment for poaching or other purposes	Medium
A1.4	Training increases knowledge of participants	Low
A1.5	Being celebrated in communities increases pride in job and subsequently a desire to work harder	Low
A1.6	Motivation of law enforcement increasing is coupled with sufficient capacity of law enforcement	Low
A1.7	Poachers have not similarly strengthened their capacity and equipment, negating any gain through an ongoing 'arms race'.	Low
A1.8	Relative value of poaching is not so high as to make increased risk of poaching worth it	Low
A1.9	Disincentive for poaching are larger than incentives	Low

In pathway 1, which focuses on reducing the effect of poaching on saigas via supporting law enforcement, we have a high or medium level of confidence in the assumptions linking activities to outputs (A1.1, A1.2, A1.3). However, for the remaining assumptions along this pathway evidence could not be found or was mixed and weak. Subsequently so we can only have a low level of confidence in the majority of this hypothesised pathway.

Code	Assumption	Level of confidence
A2.1	Activities and events are enjoyable or useful (e.g. skill building)	High
A2.2	Activities increase knowledge and awareness of participants of saiga conservation.	High
A2.3	Increased awareness leads to a change in attitude. People feel positively towards saigas and negatively towards poaching.	High
A2.4	Family members discuss their views and knowledge	High
A2.5	An increased sense of non-financial benefits contributes to willingness to take stronger action against poachers.	Medium
A2.6	Poachers care about the opinions of their family members enough for it to influence their decisions	Low
A2.7	People care about the opinions of their communities	High
A2.8	Disincentive for poaching are larger than incentives	Low

Pathway 2 of the poaching ToC focuses on changing social norms towards poaching. We can have a high level of confidence in the majority (5/8) of our assumptions along this pathway and so we can be confident that our proposed activities will lead to the desired impact of reducing the effect of poaching on saigas.

Table 6: Assumptions from pathway 3 of poaching ToC and corresponding level of confidence

Code	Assumption	Level of confidence
A.31	Campaign reaches enough people to have an impact	Low
A3.2	There are no other drivers of consumption from cities other than people viewing saiga meat as a special or fashionable meat	Low

A3.3	Activities increase knowledge and awareness of participants of saiga conservation	High
A3.4	Increased awareness leads to a change in attitude. People feel positively towards saigas and negatively towards poaching.	High
A3.5	Family members discuss their views and knowledge	High
A3.6	Mothers listen to the opinions of their children	Medium
A3.7	If people know that saiga meat is illegal they will not purchase it	Low
A3.8	There are no other incentives to buying saiga meat other than it being in vogue or viewed as a special treat	Low
A3.9	Amount of money that can be obtained from alternative livelihoods is enough to cover higher costs of alternative meat sources	Low
A3.10	Women control what meat is bought and eaten in household	High
A3.11	Demand from urban communities is not replaced by increased demand from rural communities	Low
A3.12	Demand from rural communities is not replaced by increased demand from urban communities	Medium
A3.13	Demand for meat decreasing is coupled with demand for horns decreasing	Low
A3.14	Incentives are weakened so that poaching is no longer an attractive livelihood	High

This pathway hypotheses how we can change attitudes towards meat consumption in communities in order to reduce poaching pressure on saigas. There are mixed levels of confidence of the underlying assumptions of this pathway. 7/14 of the assumption have a low level of confidence. These assumptions need to be tested to determine if they are false.

Table 7: Assumptions from pathway 4 of poaching ToC and corresponding level of confidence

Code	Assumption	Level of confidence
A4.1	Participants are adequately trained and supported	Low
A4.2	Involvement leads to pride	Medium
A4.3	Alternative livelihood programmes provide jobs for families that would otherwise be involved in poaching	Low
A4.4	Communities that are more empowered and receive benefits from wildlife value it more	High
A4.5	Alternative livelihood schemes do not generate perverse incentives, i.e. money gained is not reinvested in poaching	Low
A4.6	Alternative livelihoods do not become additional livelihoods that supplement instead of replace revenue from poaching.	Low
A4.7	Income from alternative livelihoods is substantial and appropriately targeted within the household, so that it displaces income from poaching.	Low
A4.8	Higher income is spent on more expensive meats than saiga meat	Low
A4.9	Increased value of wildlife to communities leads to increased incentive to protect it	Medium
A4.10	Incentives from poaching do not outweigh the incentives to protect wildlife	Low
A4.11	The relative value of poaching is not so high that communities participate in poaching anyway	Low
A4.12	Demand from rural communities is not replaced by increased demand from urban communities	Low
A4.13	Demand for meat decreasing is coupled with demand for horns decreasing	Low

A4.14	Incentives are weakened so that poaching is no longer an attractive livelihood	High

Pathway 4 of the poaching ToC focusses on the role that supporting alternative livelihoods could have in reducing pressure on saigas from poaching. The results of table 7 show that this ToC needs to be carefully examined as 9/14 of the assumptions are of a low level of confidence. These need to be tested to determine if any key assumptions are hard to support or even false.

3. Prioritising reduction of uncertainties

The following results are from examining our separate ToCs and deciding which strands are the most important and fundamental to reaching our desired impact. And consequently, which assumptions are most fundamental. This allows us to set priorities in terms of data collection in order to reduce our uncertainties.

Examining the Theory of Change developed for decreasing pressure on saigas from oil and gas companies

The SCA has interventions that align with all three proposed activities on the oil and gas ToC. However, due to funding and resource constraints the interventions focus mainly on achieving the activity of holding educational activities at oil and gas companies. For this reason, we can focus on the compensation actions strand of the oil and gas ToC (see fig. 15).

Fig 15: 'compensation actions' strand from original oil and gas ToC
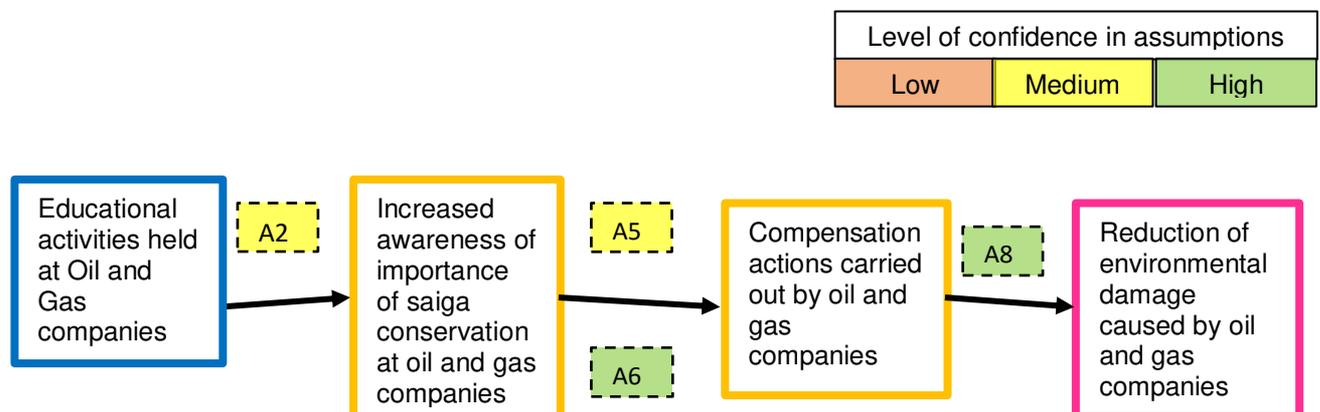
We can see from figure 15 that to have confidence in the entire hypothesised pathway we need to prioritise evidence collection for assumption A2 (Participants leave educational events with increased knowledge) and assumption A5 (Increased awareness of government and businesses leads to an attitude change and a motivation to reverse and minimize environmental damage). Priority should be assigned to these assumption as we currently only have a medium level of confidence in these assumptions. The second way we can prioritise assumption testing is by feasibility, bearing in mind the SCA's capacity. Assumption A2 could be tested relatively easily by incorporating a questionnaire before and after any educational activities and comparing the results to see if knowledge of participants increased.

Examining pathway 1 of Theory of Change developed for decreasing pressure on saigas from poaching via supporting law enforcement

Pathway 1 from out poaching ToC separates the outputs into two categories: increasing motivation and increasing capacity of law enforcement. In terms of prioritising I've chosen to focus on the strand of increasing capacity based on a hope that there will at least be some base level motivation of law enforcement to fulfil their job role. Having a basic capacity to recognise and deal with saiga related wildlife crimes is more fundamental and so I am focusing on this strand (fig.16). Activity 'provide equipment for law enforcement' has been excluded as there is no current SCA intervention aligned with it.

Figure 16: 'Capacity of law enforcement' strand from pathway 1 of overall poaching ToC
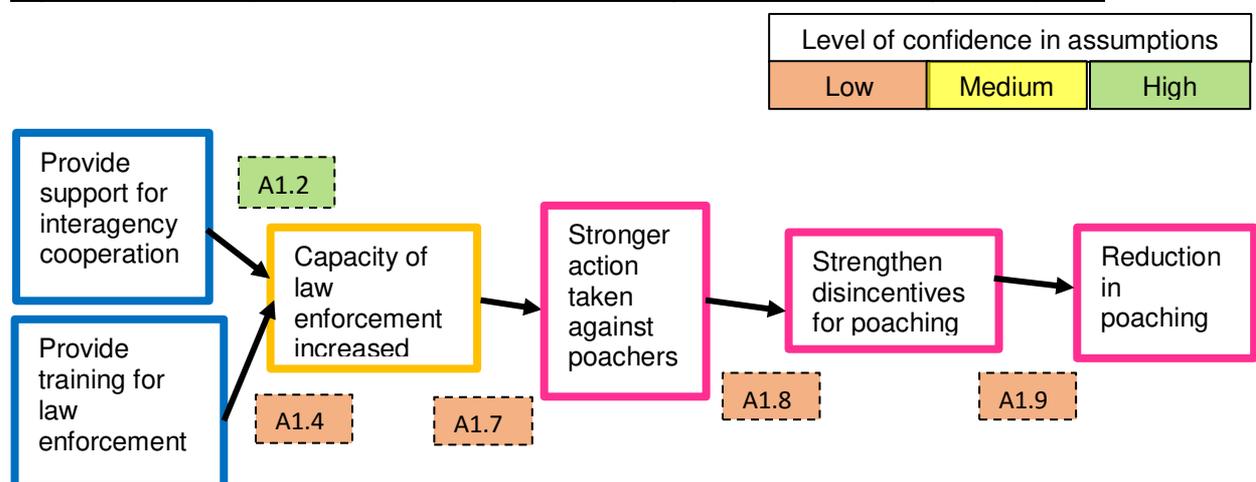
We have a low level of confidence in 4 out of 5 of our assumptions for this strand. Assumption A1.4, A1.7, A1.8 and A1.9 all need to be investigated in order for us to be confident that our proposed activities will results in our desired outcomes. Priority for reducing our uncertainties can be assigned by taking into account feasibility. Assumption A1.7 (Poachers have not similarly strengthened their capacity and equipment, negating any gain through an ongoing 'arms race') and A1.8 (Relative value of poaching is not so high as to make increased risk of poaching worth it) could both be tested within the current capacity of the SCA. For example, evidence for assumption A1.7 could be provided by arrest statistics and assumption A1.8 could be potentially be tested using local community surveys to understand whether local people are more worried about law enforcement after the capacity-building than beforehand.

Examining pathway 2 of Theory of Change developed for decreasing pressure on saigas from poaching via changing social norms towards poaching

For the pathway 2 of the poaching ToC I have chosen to focus on the strand that leads directly to our desired impact. This strand summarised below in fig.17.

Figure 17: 'Educational activities and community events' strand from pathway 2 of overall poaching ToC
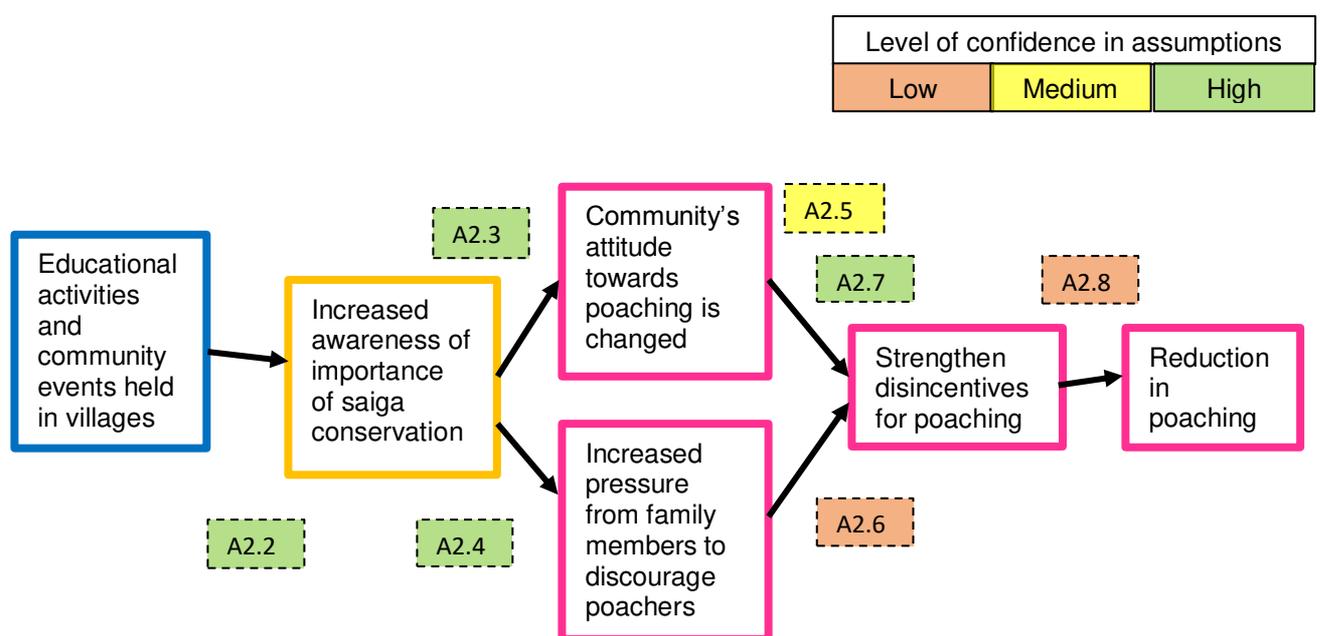
Firstly, we need to prioritise evidence collection for the assumption with a low level of confidence. These are assumption A2.6 (Poachers care about the opinions of their family members enough for it to influence their decisions) and assumption A2.8 (Disincentive for poaching are larger than incentives. The second way we can prioritise assumption testing is by feasibility. Assumption Although assumption 2.8 is a fundamental assumption it is a complicated assumption to test and so focus may be better off on collecting evidence for assumption 2.6 which us more feasible and achievable.

Examining pathway 3 of Theory of Change developed for decreasing pressure on saigas from poaching via changing community attitudes to saiga meat consumption

The outcomes from our 3rd poaching pathway can be split into two categories: reducing demand from rural villages and reducing demand from wealthy urban communities. The demand from rural communities is currently a much larger portion of the consumer demand, according to interviews and literature. And so, this is where our priorities should currently lie, with a monitoring brief on urban demand in case it continues to expand. This strand is represented below in fig.18.

Figure 18: 'Educational activities and community events' strand from pathway 3 of overall poaching ToC
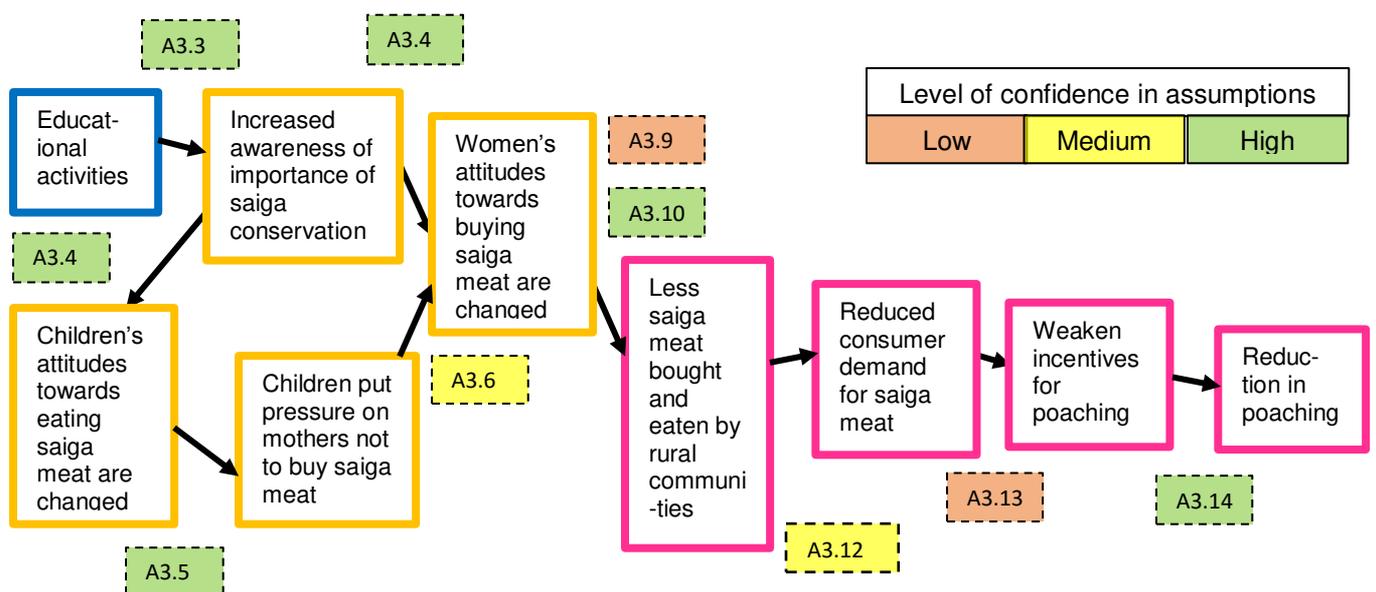
From figure 18 we can see that our lowest levels of confidence are in assumptions A3.9 (Amount of money that can be obtained from alternative livelihoods is enough to cover higher costs of alternative meat sources) and A3.10 (Incentives from poaching do not outweigh the incentives to protect wildlife). Collecting evidence to support assumption A3.9 is the most feasible. A study that examines both the income made from alternative livelihood schemes and the cost of meat is achievable by the SCA and similar studies have been conducted in the past.

Examining pathway 4 of Theory of Change developed for decreasing pressure on saigas from poaching via developing alternative livelihoods

For the pathway 4 or the poaching ToC I have chosen to focus on the strand that leads directly to our desired impact. This strand summarised below in fig.19.

Figure 19: 'alternative livelihoods' strand from pathway 4 of overall poaching ToC
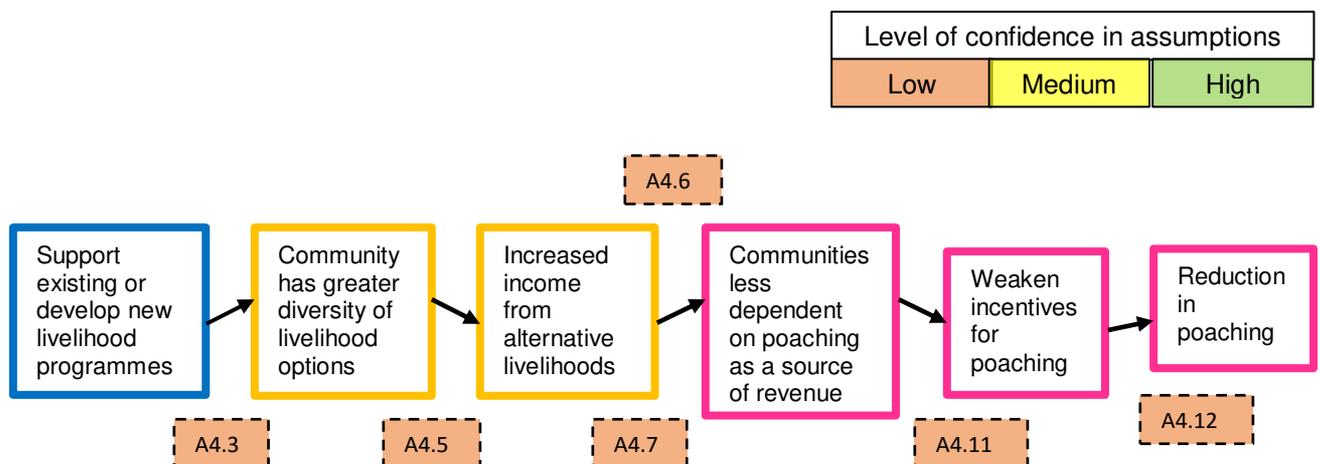
There is a low level of confidence in all of the assumptions underpinning this strand. Ideally all assumptions would be tested but as a priority the SCA could focus on assumptions A4.6 (Alternative livelihoods do not become additional livelihoods that supplement instead of replace revenue from poaching) and A4.7 (Income from alternative livelihoods is substantial and appropriately targeted within the household, so that it displaces income from poaching). These two assumptions underpin one of the most fundamental links in the pathway, the hypothesis that increased income leads to a decreased dependency on poaching as a source of revenue.

Discussion

1. Recommendations to the SCA

Using the ToC approach with the SCA's work in Uzbekistan as a case study revealed some very interesting results and shows the potential this approach has as a framework for future evaluation, planning and learning. Two main ways the SCA could focus future data collection and evaluation were apparent from our results. The first is to prioritise areas where uncertainty is the highest. For example, both the pathways for 'Increasing capacity of law enforcement' and 'Alternative livelihoods' are underpinned by assumptions for which we have a low level of confidence in the majority of our assumptions. This indicates that our assumptions, and subsequently the pathway itself, could be inaccurate.

A second area where future evaluation could be prioritised is where there is a relatively easy adjustment or addition to monitoring or project implementation that can be made to increase our confidence in our assumptions. For example, examining the strength in our assumptions in the 'Compensation actions' strand in our pathway to reduce the impact from oil and gas companies there was only one assumption in the pathway that we could not have a high level of confidence in. This assumption was that 'participants leave [educational activities] with increased knowledge'. This would be a relatively easy assumption to gather evidence for. A questionnaire or survey of participants could be carried out before and after educational activities to assess any different in knowledge of participants. This is a very feasible action which, if collected evidence confirmed our assumption, would allow us to have a high level of confidence in our entire 'compensation action' pathway.

2. In what ways was the ToC approach useful?

The ToC approach is a useful tool because it provides a framework for evaluation planning (James 2011; Roger 2014). ToCs have been used in conservation but they often neglect to make their underlying assumptions explicit and are primarily in the form of results chains (Margoluis et al. 2013). ToCs have also been widely used in

the field of international development, where there has been a focus on making underpinning assumptions explicit (e.g., Vogel 2012; Piggot-Irvine et al. 2015; Valters 2015). Recently, there has been a move in the field of conservation to include this core component of ToCs (e.g., Biggs et al. 2016). Using a ToC approach that does not neglect the underlying assumptions allows us to assess the strength of our hypothesised pathways and subsequently identify priorities for monitoring and evaluation.

The ToC approach is a particularly useful tool for small NGOs, such as the SCA. Small NGOs are often challenged with limited resources including time, money and personnel (Swindle 2011). A system of evaluation is needed that is sufficiently rigorous to ensure that funds are well used and lessons learnt, but sufficiently simple and small scale to ensure that the process is feasible (Riddell et al. 1997). The ToC approach is well suited to these needs. It is an efficient system as it creates a bespoke conceptual model that can be used across a range of programmes (Pollard 2013). It also tackles time challenges by being reusable and it helps to prioritise evaluation so limited resources can be used in a streamlined way.

3. How could the SCA use this approach in the future?

ToC is intended to be an evolving tool that is tested and improved over time (Anderson 2005) and there is huge potential for the approach to be utilised by the SCA in the future.

ToCs are used widely as communication tools (James, 2011). For example, Oxfam uses ToCs to help project partners' target beneficiaries and agree on a joint vision of what they want to achieve and how (James 2011). ToCs are a relatively simple way to view a complex and dynamic set of interactions. The ToC diagrams are a good visual representation and could be used by the SCA as a communication tool to explain project priorities and management decisions to various stakeholders or potential donors.

The ToC approach can be used as a tool for strategic planning. For example, the UK Department for International Development (DFID) uses ToCs for program design. As

part of a stronger focus on outcomes and impacts based on evidence, all DFID departments and country programs commissioning work or seeking funding now include a ToC analysis (James 2011). The approach can be used in the selection of interventions and it allows us to assess the feasibility of reaching goals, to avoid implementing an activity that is unlikely to be effective and manage expectations about the resources and amount of work required to reach goals (Woodhouse et al. 2016). It also allows us to incorporate evaluation into programme design which can improve the effectiveness of evaluations. The ToC approach can help planners explicitly link interventions to expected outcomes and impacts and determine the variables most likely to be used to test underlying assumptions. In this way, it can help project managers to practice adaptive management by monitoring these key variables during the life of the project, but also, it will produce concrete data that can be used in any post-project evaluation (Todd et al. 2007).

4. Limitations and areas for improvement in methods

Guidelines that have been created for ToC development recommend a participatory process that ideally involves more than one or two people and some recommend a workshop based approach where the creation of the ToC is truly collaborative (Actknowledge 2003, Biggs et al. 2015, Conservation International 2013). Our sample size in this project was limited as the team in Uzbekistan is very small and spread over different countries and so organising a workshop with the project team would've been unfeasible. It is possible that data collection from interviews could have been improved by using the Delphi method.

This technique is described by Skulmoski et al. (2007) as an "iterative process to collect and distill the anonymous judgments of experts using a series of data collection and analysis techniques interspersed with feedback". The approach was first developed in 1948, it is a flexible approach that has been used in many disciplines including conservation and environmental management (Burgman 2005, Mukherjee 2015). It is a research tool that is suited to understanding problems, opportunities and solutions (Linstone and Turloff 1975). The Delphi approach could suit the information gathering stage of the ToC process well as it would allow us to aggregate the opinions of a range of experts and build consensus about how the

theory of change is conceptualised. This can be achieved using questionnaires and so avoids the need for experts to meet in person in a workshop format.

Another limitation to the method I used is that there are certain elements in this approach that are necessarily subjective. Particularly, assessing the strength of our assumptions and assigning them to one of three categories of confidence (low, medium or high). This is based on the view of one person. I sought to be as impartial and fair as possible, but it is possible that other would categorise the assumptions to different confidence levels. However, this still provided insights and was necessary to inform subsequent evaluation activities and once the assessment has been made, it can be challenged, in an adaptive way.

5. Concluding remarks

The ToC approach and the visual diagrams it produces should be viewed as subjective interpretations of the change process and used as evolving frameworks to guide implementation and evaluation (Vogel 2012). I found the ToC approach to be rigorous and adaptable and able to handle the complexity of the environments that conservation interventions take place in. It has provided a framework for evaluation, clarified several further research questions and has potential to inform future quantitative evaluation activities.

In addition to the challenges presented by detail and dynamic complexity, there are real and very practical limits to what data are feasible to collect and use for evaluation. The magnitude of these limits differ from project to project, but invariably, time and budget constraints mean that project managers must be selective when deciding what to measure for evaluation purposes. This is especially true in small NGOs such as the SCA. The ToC approach allows for plausible evaluation plans to be constructed. It assists evaluators in understanding the assumed causal mechanisms that lead from action to results and it can guide evaluators to identify and select the best data and information to collect under different project conditions.

As well as having potential for future use by the SCA the ToC approach could be widely utilised in the field of impact evaluation in conservation. Helping

conservationists to demonstrate the measurable and attributable impacts of their actions. The focus on explanation, on the how and why of impacts, that this approach is so strong on could be very important for lesson learning within and between conservation organisations.

Acknowledgements

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Management report

I began considering the topic I would most like to tackle for my project during the Michaelmas term of my second year. Conservation has always been my main area of interest and so I began contacting and meeting with potential supervisors who were offering projects related to conservation. In Hilary term of 2nd year I decided to commit to a project with Professor E. J. Milner Gulland with the broad idea of looking at impact evaluation in conservation and using the Saiga Conservation as a case study. Over the course of Hilary term we continued to confer on which direction we should take. The field of impact evaluation is a large one and so I conducted a large review of literature on the topic before deciding to look more specifically at the Theory of Change approach. We also decided to narrow the case study down to the Saiga Conservation Alliance's work in Uzbekistan only, acknowledging that with time constraints it was only feasible to examine one country fully.

In Trinity term of 2nd year I began my project. My first step was to research and decide upon the various ways to carry out a Theory of Change approach. Throughout trinity term of 2nd year I organised meetings with the SCA project team in Uzbekistan to acquire the information needed construct my Theories of Change. I had originally hoped to complete all the necessary interviews before the end of trinity term but due to the limited availability of the project team I had to complete my last interviews over the summer.

Over the Summer I completed my Theory of Change approach and was ready to begin my project up write up when I returned to Oxford. Over Michaelmas term of 3rd year and December I completed the first draft of my project. I sent a full draft to my supervisor in early January. Ideally I would've liked to have sent my draft to my supervisor earlier but illness over December meant that it took me longer than anticipated to finish my first draft. However, I still felt I had time to improve upon the feedback that my supervisor gave me which allowed me to adjust and develop my write up before submission in 2nd week of Hilary term. Overall, I think I the time management of my project was suitable and allowed me to devote appropriate periods of time to each stage of my project.

Appendix A

List of assumptions which underpin the oil and gas ToC and the evidence that accompanies them

Code	Assumption	Evidence from published saiga literature	Anecdotal evidence from interviews	Wider evidence
A1	There are alternative areas for oil and gas extraction and there is no financial or other distinctive for avoiding most vulnerable and important areas			
A2	Participants leave educational events with increased knowledge	Example from: "Biodiversity and the oil-and-gas industry", Sevara Sharapova, Saiga News issue 15		
A3	There is no financial or other disincentive to using environmentally friendly best practice methods			

A4	Transition between old methods and best practice methods is relatively easy			
A5	Increased awareness of government and businesses leads to an attitude change and a motivation to reverse and minimize environmental damage			Example of government committing to reversing and minimize environmental damage: (IEEP, 2013)
A6	Correct people who can implement change are reached		Activities held at Uz-Kor Gas are attended by people who influence policy and close relationships are maintained with appropriate government/UN representatives	
A7	No other activities that damage the environment take		Unlikely as the Ustyurt is a harsh environment	

			which is unsuited for many other land uses.	
A8	Compensation actions contribute to a reversal in environmental damage	Examples where compensation actions have been carried out in the saiga range: "Kazakh government adopts a programme on conservation and rehabilitation of natural ecosystems", SCA, Saiga News, issue 12; "A new patron for saigas", SCA, Saiga News, issue 2 (date?)		Global examples of actions that can be taken to mitigate environmental damage caused by oil and gas industries: (IPIECA 1997)
A9	Best practice methods mitigate environmental damage	Examples where best practice methods have have been agreed on in the saiga range: "Kazakh government adopts a programme on conservation and rehabilitation of natural ecosystems", SCA, Saiga News, issue 12; "Mainstreaming biodiversity into industrial development of the Ustyurt Plateau", SCA, Saiga News issue 12		Global examples: (IPIECA 1997)

List of assumptions which underpin the poaching ToC and their accompanying evidence

Code	Assumption	Evidence from published saiga literature	Anecdotal evidence from interviews	Wider evidence
A1.1	People care about the opinions of their communities	Examples of social pressure/acceptablity affecting communities: (Mabbutt et al. 2014); (Hogg et al. 2015)	.	
A1.2	Interagency cooperation is helpful to law enforcement			Several case studies on illegal wildlife trade: (IUCN 2014); (Dinsmore 2015)
A1.3	Better trained and equipped guards do not use their advanced equipment for poaching or other purposes		No instances of this have been discovered to date in Uzbekistan.	

A1.4	Training increases knowledge of participants			
A1.5	Being celebrated in communities increases pride in job and subsequently a desire to work harder	Example of dedicated saiga ranger: "An impressive visit to the saiga rangers in the Stepnoi Reserve", Dominik Thiel & Conny Thiel-Egenter, Saiga News issue 13		
A1.6	Motivation of law enforcement increasing is coupled with sufficient capacity of law enforcement			
A1.7	Poachers have not similarly strengthened their capacity and equipment, negating	Possible example of increasing funding and equipment leading to success of law enforcement:	On a whole poachers have superior equipment to law enforcement.	

	any gain through an ongoing 'arms race'.	"In between the past and future", Olga Volodina, Saiga News issue 4 Example of poachers possessing equipment superior to law enforcement: "Illegal saiga hunting in Kazakhstan linked to organized crime", SCA, Saiga News issue 18		
A1.8	Relative value of poaching is not so high as to make increased risk of poaching worth it			
A1.9	Disincentive for poaching are larger than incentives			

A2.1	Activities and events are enjoyable or useful (e.g. skill building)	Examples of activities reported as fun: (Damerell et al. 2012)	Great feedback from all villages where events, particularly saiga day, are held.	
A2.2	Activities increase knowledge and awareness of participants of saiga conservation.	Examples where activities have led to knowledge of participants increasing: "Saiga day goes international!", SCA, Saiga News issue 13; "Saiga day in Kalmykia", Nadezhda Arylova, Saiga News issue 15; (Damerell et al. 2012)		
A2.3	Increased awareness leads to a change in attitude. People feel positively towards saigas and negatively towards poaching.	Examples from saiga range where education and awareness has led to positive attitudes toward saiga conservation:		Case study from Tanzania (Kideghesho et al. 2007)

		(Samuel, 2011); (Howe, 2009); (Damerell et al. 2012)		
A2.4	Family members discuss their views and knowledge	Account of children refusing to eat saiga meat: "Steppe Wildlife Clubs: from an initiative to results", Natalya Shivaldova, Saiga News issue 17	Feedback from parents and teachers suggests that children often discuss what they learn about saigas in school.	
A2.5	An increased sense of non-financial benefits contributes to willingness to take stronger action against poachers.			Brooks (2010) suggests that non-financial benefits (e.g. pride, sense of ownership) can be an important determinant of conservation outcomes.
A2.6	Poachers care about the opinions of their family members enough for it to			

	influence their decisions			
A2.7	People care about the opinions of their communities	See A1.1		
A2.8	Disincentive for poaching are larger than incentives			
A3.1	Campaign reaches enough people to have an impact			
A3.2	There are no other drivers of consumption from cities other than people viewing saiga meat as a special or fashionable meat			
A3.3	Activities increase knowledge and awareness of	See A2.2		

	participants of saiga conservation		
A3.4	Increased awareness leads to a change in attitude. People feel positively towards saigas and negatively towards poaching.	See A2.3	
A3.5	Family members discuss their views and knowledge	See A2.4	
A3.6	Mothers listen to the opinions of their children	Account of children refusing to eat saiga meat and this influencing their mothers: "Steppe Wildlife Clubs: from an initiative to results", Natalya Shivaldova	

A3.7	If people know that saiga meat is illegal they will not purchase it		Many are not aware but we do not know for sure that making them aware will have an effect – but seems likely.	
A3.8	There are no other incentives to buying saiga meat other than it being in vogue or viewed as a special treat			
A3.9	Amount of money that can be obtained from alternative livelihoods is enough to cover higher costs of alternative meat sources	Evidence that the current SCA alternative livelihood programme does not generate enough income to cover high costs of alternative meat: (Damerell 2013)		

A3.10	Women control what meat is bought and eaten in household	"Traditional embroidery as a source of additional income for the women of the Ustyurt", SCA, Saiga News issue 7	Women perform very traditional roles in households including controlling what is bought and eaten.	
A3.11	Demand from urban communities is not replaced by increased demand from rural communities		Urban demand is a new trend whereas the demand from rural villagers is currently the main demand	
A3.12	Demand from rural communities is not replaced by increased demand from urban communities		Seems unlikely as currently the demand from rural villages is a much smaller proportion and does not appear to be growing	
A3.13	Demand for meat decreasing is coupled with demand for horns decreasing		Horns are much higher in demand and the main reason for poaching is for horns.	

A3.14	Incentives are weakened so that poaching is no longer an attractive livelihood	Evidence that poaching is considered an unattractive option: (Kuhl et al. 2009)	Already not very attractive. High risk and dangerous.	
A4.1	Participants are adequately trained and supported			
A4.2	Involvement leads to pride			Sense of ownership and pride is an important outcome of allocating rights and responsibilities to communities (Brooks 2010; Salafsky et al. 2001)
A4.3	Alternative livelihood programmes provide jobs for families that would otherwise be involved in poaching			
A4.4	Communities that are more empowered and receive benefits from wildlife value it more			Evidence from a range of natural resource management settings and behavioural experiments (e.g. Child 1996; Gelcich et al. 2006; Ostrom 1990; Ostrom 2005; Salafsky et al. 2001)

A4.5	Alternative livelihood schemes do not generate perverse incentives, i.e. money gained is not reinvested in poaching			Example of additional income subsiding higher levels of exploitation: (Damania et al. 2005).
A4.6	Alternative livelihoods do not become additional livelihoods that supplement instead of replace revenue from poaching.	An example of an alternative livelihood scheme that includes an agreement not to support poachers: "A project on the creation of alternative livelihood in Kalmykia", Saiga News issue 3		Examples of alternatives supplementing incomes and exploitation of resources continuing: (Torell et al. 2010)
A4.7	Income from alternative livelihoods is substantial and appropriately targeted within the household,	Example of an alternative livelihood programme that has not improved income significantly:		

	so that it displaces income from poaching.	"Using embroidery to address saiga poaching in the Ustyurt Plateau", Damerell, Bykova, Milner-Gulland, Saiga News issue 16		
A4.8	Higher income is spent on more expensive meats than saiga meat			
A4.9	Increased value of wildlife to communities leads to increased incentive to protect it			Example of need for local communities to value the resource highly in order to be willing to actively manage it: (Inamdar et al. 1999)
A4.10	Incentives from poaching do not outweigh the incentives to protect wildlife			
A4.11	The relative value of poaching is not so high	Profitability of large scale exploitation that		

	that communities participate in poaching anyway	occurs on the Ustyurt is likely to be high: (Kühl 2008)		
A4.12	Demand from rural communities is not replaced by increased demand from urban communities			
A4.13	Demand for meat decreasing is coupled with demand for horns decreasing	See A3.13		
A4.14	Incentives are weakened so that poaching is no longer an attractive livelihood	See A3.14		

Appendix B

Summary of inputs from the oil and gas ToC and corresponding interventions from the SCA Year-Start Work Plan for 2016

Input	SCA intervention
Most important or vulnerable areas for saiga populations identified	Participatory monitoring, scientific expeditions
Education activities held at oil and gas companies	Project CEU-6 "Oil and gas for saiga conservation", involving oil and gas employees in Saiga Day
Best practice methods for oil and gas companies developed aimed at mitigating environmental damage	Joe Bull did a consultancy on this

Summary of inputs from the poaching ToC and corresponding interventions from the SCA Year-Start Work Plan for 2012

Input	SCA intervention
Strong anti-poaching role models in law enforcement celebrated in communities	Excellence in Anti-Poaching award, Military police involved in sporting events around Saiga Day.
Provide support for interagency cooperation	Project RCU-4 "Illegal trade"
Provide equipment for law enforcement	No intervention
Provide training for law enforcement	Project RCU-4 "Illegal trade"
Educational activities and community events held in villages	Project CEU-2 "Saiga education"
Campaign to raise awareness of illegality and discourage consumption of saiga meat	No intervention
Educational activities	Project CEU-2 "Saiga education"

Involve community in participatory monitoring	Project RCU-1 "Participatory monitoring"
Support existing or develop new livelihood programmes	Project CEU-1 "Embroidery"