

Os jogos como nova ferramenta de intervenção para a  
conservação?

Os efeitos do jogo de tabuleiro "Savanna Life" nas comunidades do  
Ecossistema Serengeti-Mara.

Maja Grünzner

Dissertação submetida como requisito parcial para obtenção do grau de  
Mestre em Psicologia das Relações Interculturais

Orientadora:

Dr. Sílvia Luís, Researcher, ISCTE-IUL

Outubro, 2019

**ISCTE  IUL**  
**University Institute of Lisbon**

**IUL School of Social Sciences**

Department of Social and Organizational Psychology

Gaming as a novel intervention tool for conservation?  
The effects of the board game “Savanna Life” on communities in the  
Serengeti-Mara Ecosystem.

Maja Grünzner

Dissertation submitted as partial requirement for the conferral of the  
*Master in Psychology of Intercultural Relations*

Supervisor: Dr. Sílvia Luís, Researcher, ISCTE-IUL

October, 2019

## Acknowledgement

First and foremost, I am very grateful to the villagers who participated in this study playing the board game, next to sharing their time and thoughts with me.

I would like to express much gratitude to all community facilitators in Kenya and Tanzania, without whom this work would not have been possible. Thank you all very much for sharing your time, knowledge and culture and for always looking after me.

I sincerely thank NTNU Sustainability and the AfricanBioServices project for funding my research and travels to Kenya and Tanzania, next to the whole AfricanBioServices research team who accompanied me during the field trips and for educating me about the Serengeti-Mara Ecosystem and helping me coordinate the fieldwork.

I highly recognize the valuable comments of my supervisor Silvia Luís at ISCTE-IUL and Stepan Vesely from the Consumption, Environment and Traffic research group at NTNU that significantly improved the quality of the paper.

I would especially like to thank my internship supervisor Christian A. Klöckner, for involving me in the project and for inspiring me to do this study.

Thank you Bente Jessen Graae (AfricanBioService work package leader) for constantly pushing me out of my comfort zone and all the practical help in organizing everything around my fieldwork.

I would lastly like to extend my sincerest thanks to my dearest friends and fellow Master thesis students Annika Wirth, Caterina Fuligni, Lisa Bignone, and Elena Piccinelli for our countless discussions and your constant moral support.

## Author's note

The AfricanBioServices project is funded by EU Horizon 2020 grant number 641918.

## Resumo

O projeto AfricanBioServices desenvolveu o jogo de tabuleiro "Savanna Life" para contribuir para o desenvolvimento sustentável ("AfricanBioServices", 2019). O jogo representa a vida quotidiana e os problemas de uma comunidade que vive no grande ecossistema Serengeti-Mara ou à sua volta (Saíd *et al.*, 2019). Os jogadores escolhem diferentes opções para aumentar o seu rendimento durante um período simulado de quatro anos e meio, ao longo das quatro estações. O objetivo geral do jogo é alcançar a maior pontuação de bem-estar individual, bem como um resultado positivo de bem-estar grupal (Saíd *et al.*, 2019). Neste estudo, os determinantes psicológicos e os resultados do jogo são explorados através da combinação do Modelo de Satisfação no Jogo Educacional Ambiental (ENED-GEM) com a teoria do comportamento planeado. O objetivo é analisar se o resultado do jogo pode ser previsto utilizando as variáveis da teoria do comportamento planeado, e se o jogo influenciou variáveis que foram antecipadas como particularmente relevantes neste contexto: conhecimento percebido, controle comportamental percebido, atitude, conexão com a natureza, percepção de risco, benefício esperado e probabilidade de comportamentos ambientalmente prejudiciais. Foi implementado um desenho de pré-pós-teste, com 18 grupos, cada um com quatro jogadores do Quênia e Tanzânia (N = 72). Os resultados mostram que, após jogarem, os aldeões que viviam perto das áreas protegidas em África sentiram-se menos ligados à natureza e perceberam as tarefas de proteger a natureza ao seu redor e de contribuir para o bem-estar da comunidade como menos difíceis. Deste modo, "Savanna Life" influenciou parcialmente algumas variáveis psicossociais e teve um efeito não intencional na conexão com a natureza. Sugere-se que poderá ser mais útil como uma ferramenta de comunicação que permite de envolver os aldeões na discussão de tópicos ambientais difíceis do que como uma ferramenta que muda percepções de forma imediata.

*Palavras-chave:* jogos ambientais, jogo educacionais, controlo comportamental percebido, África, ENED-GEM, teoria do comportamento planeado

## Abstract

The AfricanBioServices project developed the board game “Savanna Life” as a contribution to promote sustainable development (AfricanBioServices, 2019). The game represents the everyday-life and problems of a community living in and around the greater Serengeti-Mara Ecosystem (Saíd et al., 2019). The players can choose between different options to increase their livelihood income during a simulated period of four and a half years. The overall goal of the game is to achieve the highest individual well-being score, as well as a positive well-being group outcome (Saíd et al., 2019). In this study, the psychological determinants and outcomes of the game are explored by combining the environmental educational game enjoyment model (ENED-GEM) with the theory of planned behavior. The objective is to analyze if the game outcome can be predicted using the variables of the theory of planned behavior, and if the game influenced variables that were anticipated as particularly relevant in this context: perceived knowledge, perceived behavioral control, participant’s attitude, connectedness to nature, risk perception, expected benefit and likelihood of environmentally harmful behaviors. A pre-post-test study design was implemented, with 18 player groups, each group having four players, from Kenya and Tanzania ( $N = 72$ ). After playing the board game villagers perceived it was less difficult to do something to protect the nature around them and to contribute something towards the well-being of their community, but they felt less connected to nature. As such, “Savanna Life” partly influenced a few psychosocial variables and had an unintended effect. It is suggested that it can be useful in creating a common ground to engage villagers in discussing difficult topics around environmental issues.

*Keywords:* Environmental games, educational games, perceived behavioral control, Africa, ENED-GEM, theory of planned behavior

## Table of Contents

Acknowledgement.....	I
Resumo.....	II
Abstract .....	III
Tables.....	IV
Figures .....	V
Introduction.....	1
<b>Chapter I: Conservation and behavior change of environmentally harmful behaviors in protected areas.....</b>	<b>2</b>
<b>Chapter II: Gaming as environmental communication tool to change behavior .....</b>	<b>4</b>
<b>Chapter III: Environmental Educational Game Enjoyment Model (ENED-GEM).....</b>	<b>6</b>
<i>External influential factors</i> .....	7
<i>Learning Outcomes</i> .....	8
Increased Knowledge.....	8
Perceived behavioral control.....	8
<b>Chapter IV: The Theory of planned behavior and context specific extension of learning outcomes....</b>	<b>9</b>
<i>Attitudinal-type variables</i> .....	12
Attitudes towards nature use .....	12
Connectedness to nature.....	12
Risk perception and expected benefit of environmentally harmful behaviors.....	13
<i>Normative-type variable</i> .....	14
Social Norms towards the environmentally harmful behaviors .....	14
<i>Behavioral-type variable</i> .....	15
Likelihood of performing environmentally harmful behavior as behavioral Intention .....	15
<i>Summary</i> .....	15
<b>Chapter V: Hypotheses .....</b>	<b>16</b>

<b>Chapter VI: Methods .....</b>	<b>18</b>
<i>Participants.....</i>	<i>18</i>
<i>Instruments.....</i>	<i>19</i>
Savanna Life.....	19
Questionnaire .....	20
<i>Procedure.....</i>	<i>22</i>
<b>Chapter VII: Results .....</b>	<b>23</b>
<i>Game outcomes.....</i>	<i>23</i>
<i>Game effect on psychosocial variables.....</i>	<i>24</i>
<i>Prediction of environmentally harmful behaviors .....</i>	<i>26</i>
<b>Discussion .....</b>	<b>28</b>
<i>Game effect on psychosocial variables.....</i>	<i>29</i>
Perceived behavioral control.....	29
Connectedness to nature.....	30
<i>Prediction of environmentally harmful behaviors .....</i>	<i>31</i>
<i>Limitations and challenges .....</i>	<i>32</i>
Sampling .....	32
Response Bias .....	32
Interviewer Bias .....	32
Cultural Insensitivity.....	33
<i>Implications for future research .....</i>	<i>34</i>
Repeated play.....	34
Narrative transportation .....	34
<i>Conclusion .....</i>	<i>35</i>
<b>References.....</b>	<b>36</b>
<b>Appendix.....</b>	<b>41</b>
<i>Appendix A - Questionnaire.....</i>	<i>41</i>
<i>Appendix B – Board Game Manual.....</i>	<i>44</i>

Tables

Table 1. Paired sample t-Test of the mean differences of the pre- and post- board game scores for the psychosocial variables..... 25

Table 2. Summary of hierarchical regression analysis for variables predicting the likelihood of livestock grazing and poaching in protected areas ( $N = 72$ )..... 27



## Figures

Figure 1. <i>The ENED – GEM framework</i> .....	7
Figure 2. <i>Theory of planned behavior</i> .....	10
Figure 3. <i>Modified ENED-GEM</i> .....	11

# GAMING AS A NOVEL INTERVENTION TOOL FOR CONSERVATION

## Gaming as a novel intervention tool for conservation?

The effects of the board game “Savanna Life” on communities in the Serengeti-Mara Ecosystem.

In the following chapters we introduce the importance of conservation and specific problems in protected areas in Africa and with it, whether a board game can contribute to reduce these problems. In concrete, the “Environmental Educational Game Enjoyment Model (ENED-GEM)” is used to explore possible psychological effects of the board game and it is investigated if the theory of planned behavior can predict the likelihood of environmentally harmful behaviors in protected areas, in particular livestock grazing and poaching.

This study was conducted with villagers from the Serengeti-Mara-Ecosystem in Kenya (Maasai-Mara National Park) and Tanzania (Serengeti National Park). It builds upon a pre-existing AfricanBioServices project that is a collaborative effort with the Tanzania Wildlife Research Institute and the International Livestock Research Institute.

## **Chapter I: Conservation and behavior change of environmentally harmful behaviors in protected areas**

The destruction of nature is largely related to human activities (Schultz, 2011). Loss of habitats and climate crisis are mostly consequences of the lifestyle and behaviors of billions of humans (Schultz, 2011). Hence, to increase conservation human behavior must change (Ehrlich & Kennedy, 2005; Schultz & Kaiser, 2012). As Balmford and Cowling (2006) state, “conservation is primarily not about biology but about people and the choices they make” (p. 692).

A major problem arises when searching for validated methods to change behavior in various countries. The majority of studies in social science have been conducted in industrialized countries, using samples of individuals that are western, educated, industrialized, rich and democratic (Arnett, 2008; Henrich, Heine, & Norenzayan, 2010). This WEIRD-bias demands more research in developing countries. Our study contributes to diminish this bias by conducting research on environmental behavior in protected areas in Tanzania and Kenya. Protected areas are “a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values (The International Union for Conservation of Nature, 2008)”. Furthermore, it is particularly relevant to conduct research on environmental behavior in African countries, because human population is increasing and with it the need for land. As such, human-wildlife conflict is likely to expand throughout the whole continent which is making conservation through protected areas harder (Browne and Jonker, 2008).

Looking at current research about protected areas, conservation crime or wildlife crime is an often used term, but it has no established definition (Hariohay, Ranke, Fyumagwa, Kideghesho, & Røskaft, 2019). Hariohay and his colleagues (2019) claim in their work that there is consensus in research that conservation crime negatively impacts people and the survival of fauna and flora. The activities of conservation crimes are brought and entail “illegal activities such as poaching, capture, collection or processing of animals and plants taken in contravention of national, regional or international laws, and any subsequent trade in such animals and plants, including their derivatives or products (Hariohay et al., 2019, p. 1)”. These behaviors have a great impact on the ecosystem and can lead to a destruction of the environment, therefore they need to be reduced (Hariohay et al., 2019). Moreover, they come with a high risk of getting

caught and being fined which can lead to imprisonment (Knapp, 2012). We will describe conservation crimes as environmentally harmful behaviors in our work and focus on poaching and livestock grazing in protected areas. Environmentally harmful behaviors are a problem for many conservancies in Africa and beyond (Gibbs, Gore, McGarrell, & Rivers III, 2009; Von Essen, Hansen, Nordström Källström, Peterson, & Peterson, 2014). Next to acting against the law, people who poach or enter the protected area without further protection, for example to let their livestock graze in the fertile areas, encounter the risk of losing resources (e.g., livestock might be by wildlife). Villager's and communities living close to protected areas, like the inhabitants of Kenya and Tanzania living around the Serengeti-Mara Ecosystem, need to make decisions regarding the use of the resource's in their environment every day.

People engage in risky behaviors like livestock grazing or poaching in protected areas for various reasons (Harriohay et al., 2019). Poverty and drought were found as main motivators to engage in poaching (Knapp, 2012). Harriohay et al. (2019) found in their work that most people who engaged in bushmeat poaching were unemployed, not owning land, between 18-36 years and immigrants. Most people who engaged in illegal livestock grazing owned livestock but did not own land and were immigrants as well. The psychosocial variables that explain livestock grazing and poaching have not yet been well explored. Therefore, in this study the theory of planned behavior is used to understand these behaviors as previous researchers have already suggested the utility of using this theory to improve conservation intervention development and conservation research (e.g. St John, Edwards-Jones, & Jones, 2011).

## **Chapter II: Gaming as environmental communication tool to change behavior**

Environmental communication is understood as an instrument to make people aware of environmental issues and leading them to more pro-environmental behavior (Cox, 2013). Krajhanzl (2010, p. 252) describes pro-environmental behavior as “behavior which is generally (or according to the knowledge of environmental science) judged in the context of the considered society as a protective way of environmental behavior or a tribute to the healthy environment.” Communication approaches that are knowledge-based will not necessarily lead to change of behavior for many reasons (Schultz, 2002b). One of them is psychological biases on environmental problems. For instance, Gifford and colleagues (2009), as well as Schultz and colleagues (2014) illustrate that people from different countries have a spatial bias, that is a tendency to perceive environmental problems as more severe at the global level than at the local level. Another reason is because people who simply receive the knowledge do not necessarily know how to perform the behavior and might find the pro-environmental behavior difficult (Luís et al., 2018).

Indeed, the need for environmental learning experience, such as an educational game is being advocated by researchers (Ballantyne & Packer, 2005; Fjællingsdal & Klöckner, 2017; Hariohay et al., 2019; Klöckner, 2015). Educational games (sometimes referred as serious games) are environmental communication tools which provide environmental learning experience to bring new knowledge and transform behavior (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012).

Educational games differ in various genres. Therefore, it is necessary to develop the models to understanding the learning processes and exploring the outcomes they might have (Riemer & Schrader, 2015; Fjællingsdal & Klöckner, 2017). Educational games bring knowledge or teach new competences through play (Griffiths, 2002; Barab, Gresalfi, & Ingram-Goble, 2010). The underlying psychological mechanisms are self-regulated learning, which implies voluntarily accessing information and skills on your own (Zimmerman, 1990).

Furthermore, contextual factors and the implementation of the educational game in the specific environment need to be thought through (Fjællingsdal & Klöckner, 2017). For example, if people think that they will not enjoy the game they will not consider playing it (Sweetser & Wyeth, 2005). Player enjoyment is crucial during the gameplay stage and influences the learning outcomes in the end (Fjællingsdal & Klöckner, 2017). Therefore, to achieve high player

enjoyment the motivation of players should be activated (Fjællingsdal & Klöckner, 2017). Sweetser and Wyeth (2005) describe numerous factors like the support of players skill development, feedback loops, opportunities for social interaction, creating a sense of control during the gameplay and an appropriate degree of challenges to increase player enjoyment (and therefore also the learning outcome). Social interaction (e.g. cooperation, competition and socialization) influences game enjoyment significantly throughout various areas of studies (Bartle, 1996; Malone, 1987; Chen, Duh, Siew Koon Phuah, & Zi Yan Lam, 2006; Jennett et al., 2008; Fu, Su, & Yu, 2009). Moreover, competition is seen as one crucial element for influencing the game experience (e.g. Vorderer, Hartmann, & Klimmt, 2003), but in comparison a cooperative goal structure was proven to increase motivation more than a competitive goal structure (Peng & Hsieh, 2012).

Regarding the game design, the complexity of the game should be adapted to the environment. Less is more. Information overload should be decreased, and the chance of behavior change should be increased through choosing topics that are highly specific in nature and dedicated to singular faceted environmental issues (Fjællingsdal & Klöckner, 2017). These conditions make the access of cognitive resources towards specific problem solving easier, because players can focus their intention directly on the environmental issues in the game (Fjællingsdal & Klöckner, 2017). Perceived behavioral control is expected to increase when it is possible to understand the problem and the behavior which is required to manage it (Ajzen, 2002). In addition, presenting the environmental problem in a novel way in which the player can identify with the game context through personal involvement and real-life relatedness can create curiosity. This curiosity can motivate to take new perspectives regarding the environmental problem and expanse knowledge (Ainley, Hidi, & Berndorff, 2002). There is a need for effective conservation education programs especially in villages around protected areas (Hariohay et al., 2019). Therefore, context related environmental educational games might be particularly effective to address these specific environmentally harmful behaviors.

## **Chapter III: Environmental Educational Game Enjoyment Model (ENED-GEM)**

The ENED-GEM considers environmental games as successful when the game players' motivation to act pro-environmental friendly increases (Fjællingsdal & Klöckner, 2017), and in reverse, the motivation to act environmental-harmful decreases. The model makes it possible to explain, provide insights and conceptualize how environmental games have an impact on knowledge and on perceived behavioral control (Fjællingsdal & Klöckner, 2017). It lays the foundation for looking into the psychological processes before, during and after playing environmental education games by distinguishing three linear stages (motivational stage, gameplay stage and learning stage, see Figure 1). Additionally, external influential factors (pre-existing environmental tendencies, sociodemographic variables, player type and repeated play) and can affect players engagement are considered as well (Fjællingsdal & Klöckner, 2017).

This framework implies that increased knowledge is not the only learning outcome (Fjællingsdal & Klöckner, 2017). Perceived behavioral control of people plays an important role for learning something through a gaming experience (Fjællingsdal & Klöckner, 2017) and emotions play an important role for making people engage in environmental issues (Weber, 2006). Therefore, gaming has several advantages as intervention as it increases the feeling of responsibility and the emotional involvement towards specific environmental issues when transforming the players to decision-makers during the game session (Klöckner, 2015). When people face situations in the board game, such as experiences of being able to do something about a specific problem, these situations can be translated to their behavior in their everyday life (Klöckner, 2015).

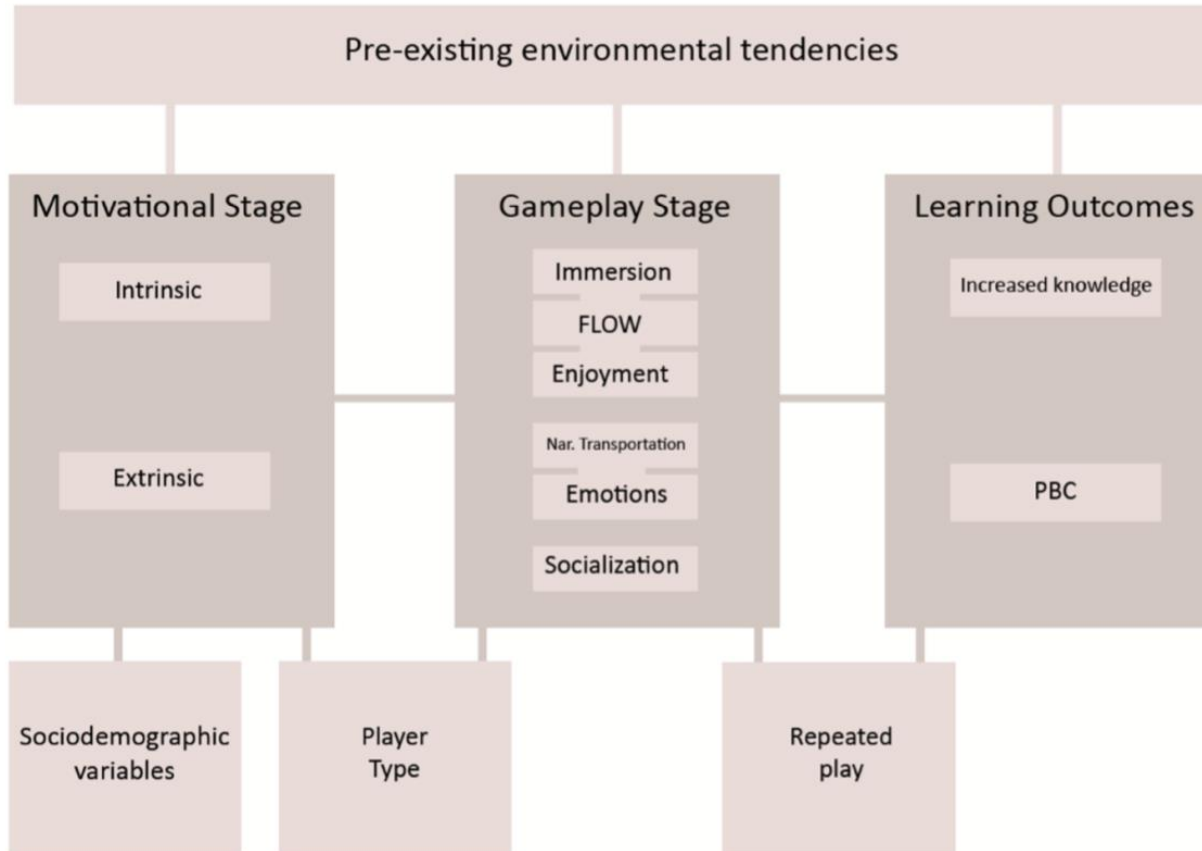


Figure 1. The ENED – GEM framework (Excerpted from Fjællingsdal & Klöckner, 2017, p. 5)

### External influential factors

According to Fjællingsdal and Klöckner (2017), pre-existing environmental tendencies are the individual’s motivation to engage with environmental issues . As an example, it can be expected that players who are already more sensitive towards their surrounding will play, and in a more sustainable manner. Concretely, we expect a villager experiencing the local effects of having too much livestock (which leads to a lack of good grassland and to the destruction of nature) to be motivated to engage in projects like ours and therefore play an environmental game about conservation behaviors.

The ENED-GEM sees the player type as crucial element for predicting the game enjoyment (Fjællingsdal & Klöckner, 2017). However, individuals tend to mix different styles and as our study was conducted with villagers living close to protected areas, the environmental board game was a new experience for each player. Therefore, we do not explore the different player types in this study.



## **Learning Outcomes**

In our study we extended the learning outcomes (increased knowledge and perceived behavioral control, see Figure 1) of the ENED-GEM with variables derived from the theory of planned behavior. This theory further focuses on the attitudinal, normative, and behavioral predictors of behavior.

### **Increased Knowledge**

In a recent study it was found that next to increasing knowledge, players of environmental games express that they build up on their already existing knowledge (Fjællingsdal & Klöckner, under review). When playing an environmental game players experience “learning by doing” while interpreting the game as “simplified reality simulation” and with it gain insights into about complex environmental topics without feeling cognitively overloaded (Fjællingsdal & Klöckner, under review).

### **Perceived behavioral control**

Perceived behavioral control is the perceived complexity of performing a behavior (Ajzen, 2002) and it influences the likelihood of acting pro-environmentally friendly (Bamberg & Möser, 2007). Eliminating challenges towards a specific behavior has shown to predict a good outcome of behavioral interventions in environmental psychology (Steg & Vlek, 2009; Thøgersen, 2009). Hence, playing an educational game eliminates challenges through showing the player how to behave in a certain situation and allowing him to experience the specific situation which then should lead to an increase of perceived behavioral control (Fjællingsdal & Klöckner, 2017).

**Chapter IV: The Theory of planned behavior and context specific extension of learning outcomes**

The Theory of planned behavior is based on the assumptions that attitudes, social norms and perceived behavioral control influence intentions and behaviors (Ajzen, 2002). It has been successfully applied to explain environmental behaviors several times (e.g. Luís et al., 2018). St John, Edwards-Jones and Jones (2011) reviewed the use of the theory of planned behavior in conservation and state that conservation and natural resource management can benefit from using social science. Klöckner (2015) collected several communication techniques in connection with the theory of planned behavior. For instance, attitude can be influenced through decreasing the number of positive beliefs about the environmentally harmful behavior and increasing the number of negative beliefs about the environmentally harmful behavior. Subjective norm can change through decreasing the salience of descriptive norms for environmentally harmful behavior. Perceived behavioral control can be influenced by increasing control beliefs for the environmentally friendly behavior and giving feedback about behavior effects (Klöckner, 2015). Furthermore, the theory of planned behavior is of relevance for this study because it seems stable between cultures, behavioral domains and target groups, being adequate for cross-country studies (Klöckner, 2015). This study was conducted as part of a larger project and, for practical reasons (such as survey length) unfortunately we could not analyze all variables of the theory and selected a few variables to focus on. As such, the theory of planned behavior was used as a framework that highlights and describes the importance of attitudinal, normative, and perceived behavioral control variables.

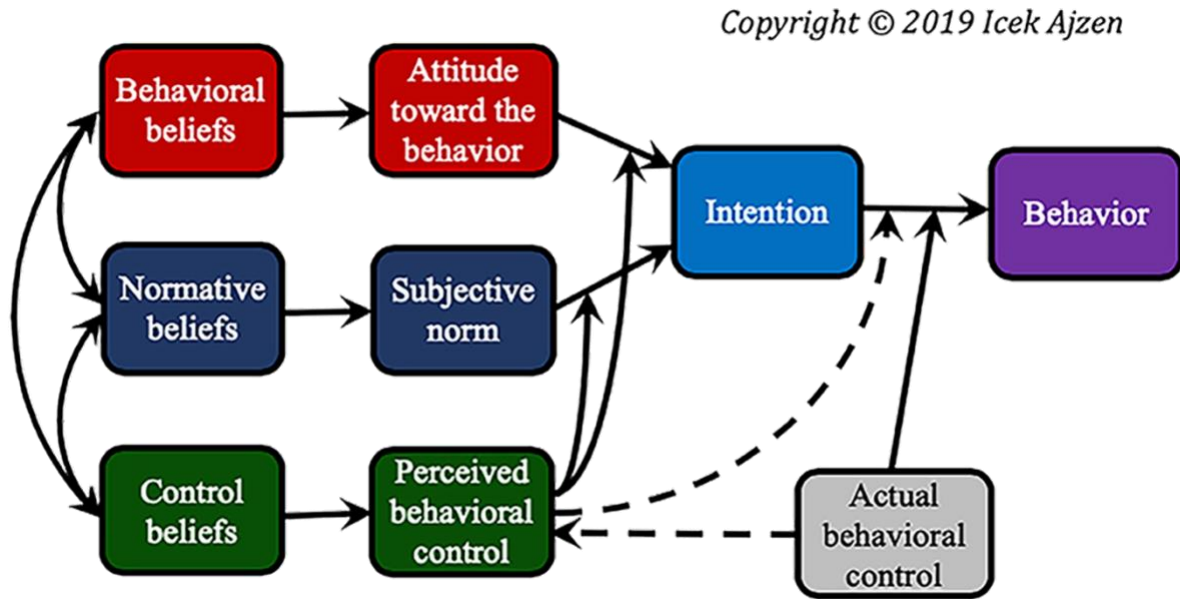


Figure 2. Theory of planned behavior (Ajzen, 1991, p. 182)

We have first investigated if the game “Savanna life” had an effect on attitudinal variables that have been illustrated as particularly important in this context (attitude towards nature use, connectedness to nature, risk perception expected benefit of environmentally harmful behavior in form of livestock grazing and poaching in the protected areas) and on intentions (likelihood of environmentally harmful behaviors regarding livestock grazing and poaching in the protected areas).

It was further examined if the variables derived from the theory of planned behavior (attitude towards nature use, descriptive norm of risk-taking and perceived behavioral control of protecting nature) predicted the likelihood of the environmentally harmful behaviors (livestock grazing and poaching in the protected areas).

# GAMING AS A NOVEL INTERVENTION TOOL FOR CONSERVATION

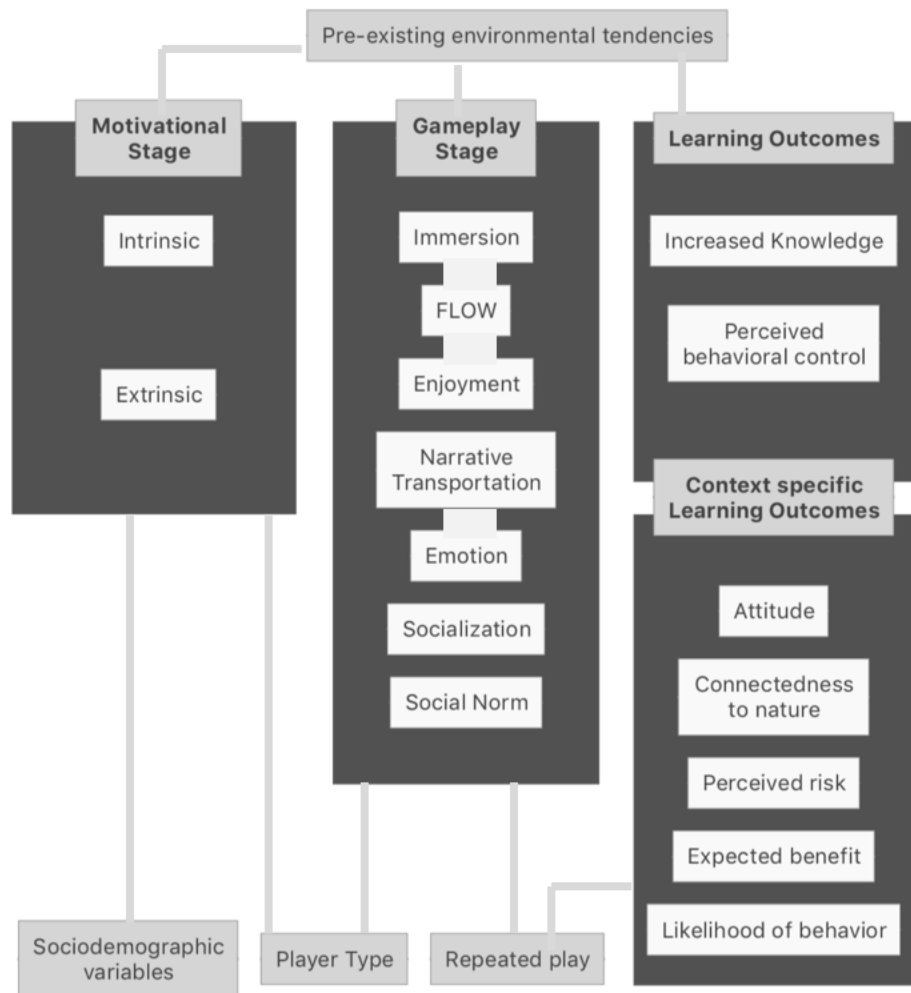


Figure 3. Modified ENED-GEM framework

### **Attitudinal-type variables**

#### **Attitudes towards nature use**

Attitudes are a collection of all “outcome beliefs” that relate to the examined behavior. They can be used for explaining behavior if they are directed and focused on the same target (Ajzen & Fishbein, 1977). As Bencin, Kioko and Kniffer (2016) found in their research, negative attitudes towards wildlife arise mostly from past conflicts and fear. Therefore, one of their suggestions is educational initiatives to decrease these negative attitudes (Bencin et al., 2016). Through the game play and the experience of nature loss through human exploitations, a possible change in the attitude towards nature use is expected. Also, topic related perceived personal involvement is proven to significantly influence peoples’ attitude regarding specific environmental problems (Kang, Liu, & Kim, 2013). Hence, the game “Savanna Life” is specifically developed and adapted to the environment and everyday-life of the participants and therefore a change in the attitude should arise. In a second step we investigate if the attitude towards nature use predicts the likelihood of environmentally harmful behavior.

#### **Connectedness to nature**

The self is always reflected in the situation and context. Two different distinctions are made: the interdependent and the independent self (Markus & Kitayama, 2010). The self has “the ‘me’ at the center of experience — a continually developing sense of awareness and agency that guides action and takes shape as the individual, both brain and body, becomes attuned to the various environments it inhabits” (Markus & Kitayama, 2010, p. 421). One of the questions which asks the “me” is “How do I relate to others?”. The independent self sees itself as “separated, distinct, or independent from others” (Markus & Kitayama, 2010, p. 423) whereas the interdependent self sees itself in “interaction with others [which] produces a sense of self as connected to, related to, or interdependent with others.” (Markus & Kitayama, 2010, p. 424).

Connectedness to nature is considered as an individual belief towards nature (e.g. (Zelenski & Nisbet, 2014) and shown to be an independent predictor of people’s intention to act pro-environmentally friendly (Sparks, Hinds, Curnock, & Pavey, 2014). Regarding the relations between the self and nature, Schultz (2002a) suggests that for individuals who define themselves as part of nature, the self and nature are connected in their representation. However, he also found evidence that individuals tend to think that they are separated from nature (Schultz, 2002a). Mostly, in western context an independent concept of self is presented while in eastern

context the interdependent concept of self is present (Markus & Kitayama, 2010). Therefore, Schultz findings that people tend to separate themselves from nature are rooted in a western context and therefore might not apply in the context of this study. A study of Ando, Ohnuma, Blöbaum, Matthies, and Sugiura, (2010) suggests that pro-environmental behaviors can be influenced by other individuals through expectations and networks. Consequently, it can be said that in a culture with strong pro-environmental norms, people with an interdependent self are more sensitive towards climate change than people with an independent self. This supports the previous mentioned results that people who identify more with nature should be more sensitive towards climate change (Schultz, 2002a).

Moreover, it was found that people who perceive themselves more connected to nature are also more willing to carry out conservation behaviors (Schultz, 2001; Mayer & Frantz, 2004; Gosling & Williams, 2010). Therefore Schultz (2011) suggests that promoting connectedness through e.g. experimental activities and environmental education could lead to more conservation behaviors, However, this study already expects that participants feel a high connectedness to nature based on their proximity to protected areas. It is therefore of high interest to observe the change in participants' perception of their connectedness to nature through playing the game, as this would extend and build upon the previous findings.

### **Risk perception and expected benefit of environmentally harmful behaviors**

Risk is considered another distal antecedent of attitude that drives sustainable behavior (Luís et al., 2018). Depending on the environment, people show risky behaviors like livestock grazing and poaching in protected areas. Poachers tend to feel a higher risk because of wildlife attacks than through law enforced poaching consequences (Knapp, 2012). The risk perception of poaching and the fear that comes with it is more influenced by the believed possible contact with wildlife, especially lions, than with anti-poaching personnel (Knapp, 2012). Knapp (2012) found that the benefit of poaching in the form of money, which the poacher in the western Serengeti can earn, when selling bushmeat, exceeds the cost of the poachers risk of getting arrested, especially when considering that poverty is high. Moreover, the chance of being arrested and a long duration of imprisonment is low (Knapp, 2012).

## **Normative-type variable**

### **Social Norms towards the environmentally harmful behaviors**

Normative beliefs are based on the perception of what the person thinks others expect and on the willingness to act out of these expectations (Ajzen, 2002). Individuals are influenced by social norms through adapting and copying behaviors which are performed by the majority of people. However, most of the time the descriptive norm is rather environmentally harmful, since most people tend to exhibit non-environmentally friendly behavior that is then copied by others (Schultz, 2011).

The meta-analysis of Rivas and Sheeran (2003) examined the possible inclusion of descriptive norms (subjective representation of other people's behavior) in the theory of planned behavior and showed that descriptive norms were important and had a stronger impact than subjective norms. Hence, in our work we investigate if the descriptive norm of risky behaviors in the protected areas during the game predicts the likelihood of engaging these behaviors (see Figure 2).

### **Behavioral-type variable**

#### **Likelihood of performing environmentally harmful behavior as behavioral Intention**

A behavioral intention is an indication of a person's readiness to perform a behavior based on attitude towards the behavior, social norms and perceived behavioral control (Ajzen, 2002).

According to the ENED-GEM Model, measuring the likelihood of environmentally harmful behavior (poaching and livestock grazing in the protected areas) pre- and post-game can indicate the effectiveness of “Savanna Life”.

### **Summary**

All in all the board game aims to foster discussion around different livelihood strategies and their consequences to increase awareness towards environmentally harmful behavior in protected areas. The study’s purpose is to evaluate the effect of the game session on villagers’ beliefs and perceptions towards poaching and grazing. Achieved through the board game Savanna Life, where participants are exposed to different scenario’s and have to make decisions towards nature use. Through this game, they experience the consequences of environment related behaviors in a safe setting. We extend the ENED-GEM learning outcomes (see Figure 3) with several psychosocial variables adapted from the theory of planned behavior and related concepts to make a proper context specific evaluation of the board game possible.



## **Chapter V: Hypotheses**

The overall objective is to investigate how the game “Savanna Life” effects various psychosocial variables and learning outcomes that are important for the specific life situations and problems of villagers living in and around the greater Serengeti-Mara Ecosystem in a within-subject design. The hypotheses are two folded. First, we focused on the effect of “Savanna Life” on several psychosocial variables. We did not measure the normative beliefs with the pre-post-test comparison due to the restrictions of survey length. In addition, we used an interactive and observable group measure of the descriptive norm of risk-taking during the gameplay, so a pre-post-test design was not applicable. Secondly, our research is based on the well-established theory of planned behavior to test the prediction of attitude towards nature use, descriptive norm of risk-taking during the board game and perceived behavioral control towards protecting nature on the likelihood of environmentally harmful behavior (livestock grazing and poaching in the protected areas).

## GAMING AS A NOVEL INTERVENTION TOOL FOR CONSERVATION

*H1* Playing “Savanna Life” effects the psychosocial variables (knowledge of contributing something towards the well-being of the community, perceived behavioral control of contributing something towards the well-being of the community and protecting nature, attitude towards nature use, connectedness to nature, likelihood, risk perception and perceived benefits of environmentally harmful behavior in protected areas,).

*H1a* Playing “Savanna Life” increases knowledge of contributing something towards the well-being of the community and perceived behavioral control of contributing something towards the well-being of the community and protecting nature, connectedness to nature, risk perception of environmentally harmful behavior (poaching and livestock grazing) in protected areas,.

*H1b* Playing “Savanna Life” decreases attitude towards nature use, likelihood and perceived benefit of environmentally harmful behaviors (poaching and livestock grazing) in protected areas.

*H2* The variables derived from the theory of planned behavior (attitude, social norm and perceived behavioral control) explain the likelihood of environmentally harmful behaviors (livestock grazing and poaching) in the protected areas.

## Chapter VI: Methods

### Participants

This study took place in the Serengeti-Mara ecosystem. During September 2018 we visited four villages in Narok County and the city Narok (higher-level Stakeholders) in Kenya and in March 2019 we visited four villages (Serengeti, Bariadi, Ngorongoro and Meatu district) in Tanzania. A detailed description of the villages has been deliberately abandoned so the anonymity of the participants is secured. A total of  $N = 72$  (44.4% female and 55.6% male) participants in the age range from 15 to 58 ( $M = 27.8$ ,  $SD = 11.02$ ) completed the questionnaire. The board game was played in four different villages. There was one male and one female group in each village. During the field trips we split in two teams per village. In total 18 groups played the boardgame with 55.6% participants from Kenya and 44.4% from Tanzania. In average the participants attended school for 9.41 years ( $SD = 4.34$ ). The villagers reported that their wealth in comparison to their community was “average/normal” ( $N = 63$ ,  $M = 2.87$ ,  $SD = 0.553$ ). As a manipulation check, participants were asked if they could relate the game to their real-life on a scale ranging from 1 - very unlikely to 5 - very likely. Participants reported that they were mildly likely to relate their game behavior towards their real-life behavior ( $M = 3.55$ ,  $SD = 1.44$ ).

## **Instruments**

### **Savanna Life**

Using their knowledge about how ongoing climate change, human population growth and the way how change of land use affect biodiversity and human well-being the AfricanBioServices project developed the board game “Savanna Life”. The game represents the everyday-life and problems of a community living in and around the greater Serengeti-Mara Ecosystem and it is directed towards people and their livelihood strategies in Africa. It was created “as a learning tool to enable local households and ultimately communities to evaluate the consequences of livelihood strategy choices and investment and to safely explore alternative strategies.” (Saíd et al., 2019, p. 76). During a simulated period of four and a half years, including all four seasons, the players choose different options to increase their livelihood income through agriculture, pastoralism, poaching and tourism which is followed by various consequences for the player. They have further choices of investing in well-being through healthcare or sending children to school. The overall goal of the game is to achieve the highest individual well-being score, next to an overall positive well-being balance among the four players (which can be achieved through cooperation) (Saíd et al., 2019). A detailed manual can be found in Appendix B.

### **Questionnaire**

We measured the psychosocial variables with a questionnaire before and after the game play. We were instructed to have a reduced number of questions, so variables were measured with single items, all on a 5-point Likert rating scale. Some of them were validated in western context. For contextual reasons and for easier translations we simplified some of them. The questionnaire can be found in Appendix A.

#### ***Perceived behavioral control-type variables***

##### *Knowledge of contributing something towards the well-being of the community*

The perceived knowledge is related to one of the perceived behavioral control variables and was measured on a 5-point Likert scale from 1 (No knowledge) to 5 (Great knowledge).

##### *Perceived behavioral control-type variables*

Perceived behavioral control *of contributing something towards the well-being of the community and protecting nature* was measured with a 5-point Likert scale from 1 (Very difficult) to 5 (Very easy). The item formulations are in line with the guidelines of Ajzen's constructions of a theory of planned behavior questionnaire (Ajzen, 2006) and focus on the challenges and behavior mentioned in the board game.

#### ***Attitudinal-type variables***

##### *Attitude towards nature use*

Browne-Nuñez and Jonker (2008) concluded in her review that there's a need of validated attitude measurements in African context. Therefore, the validated item for attitude towards nature use from the research of Milfont and Duckitt (2010) was chosen as single item.

##### *Connectedness to Nature*

For measuring the peoples' connectedness to nature we used a revised version of Schultz' Inclusion of Nature in Self Scale (Liefländer, Fröhlich, Bogner, & Schultz, 2013). Participants could choose from A (Feeling completely separated from nature) to E (Feeling completely connected to nature)

*Risk perception and expected benefits of environmentally harmful behavior in protected areas.*

The 5-point Likert rating scales used to measure risk perception and expected benefits have shown reliability in Weber, Blais and Betz (2002) work.

### ***Normative-type variable***

The normative variable was measured through the game experience. The game strategy risk-taking was obtained from the gaming protocols and an index was conducted, which corresponds to the descriptive norm of engaging or not the behaviors.

### ***Risk taking***

Risk taking was measured through the sum of players moves into the board game field 13 (livestock grazing) and 14 (poaching) in the protected area followed by one positive, five negative or two neutral consequences. Every gameplay year during the short rain season each participant could choose to take the risk to enter into the protected area with one of their “men” and up to two “cattle” until all the resources (12 “grass” and four “wildlife”) were exploited or all of their “men” were on the field. Each new year the protected area could be refilled with four new grass and one wildlife. Each player has five “men” in the first year and can gain up to 11 “men” in total. The short rain ends when all “men” are distributed among the fields.

### ***Behavioral-type variable***

#### ***Likelihood of the environmentally harmful behavior in protected areas.***

The 5-point Likert rating scale used to measure the likelihood of a behavior was proven to be reliable in Weber, Blais and Betz (2002) work and the context related items for poaching and livestock grazing in protected areas was developed.

#### ***Game relatedness to everyday-life***

In the end of the game, the degree to which the behavior in the board game related to people’s everyday life of the game experience towards reality was measured through one item with a 5-point Likert rating scale ranging from very unlikely to very likely.

### **Procedure**

Before starting the first round of the board game we gave a brief introduction about the whole project, the anonymity and voluntarily of participation. An anonymous questionnaire was handed out to villagers and other stakeholders (managers and policy makers) living close to protected areas in the greater Serengeti-Mara-Ecosystem. During the whole procedure local translators were in the field to translate from English in Swahili and Maa. After agreeing to take part in the study, the participants were split into groups with each four male and female players and the sociodemographic factors, next to the psychosocial variables were examined. Then we explained the board game and a game trial round started. A short break with lunch followed. Afterwards we started the recorded game play in presence of a facilitator and enumerator. The enumerator recorded each players moves on a sheet to see what strategy they chose. The data collection was added to this activity as a short questionnaire before and after the game play. Individuals were paid for their participation followed by a final discussion about the experience

## Chapter VII: Results

### Game outcomes

After collecting all the data, the player groups were divided by the game outcome (positive-score-group vs. negative-score-group). It was communicated that the groups could “win” the game when all of them had a positive fortunate score and “lose” the game when at least one of the players in the group had a negative fortunate score. A positive score was held by 38.9% of the groups. Hence, we had less positive-score-groups than negative-score-groups which means that more groups “lost” the game. On a scale from -5 to 10 the average final fortunate score was 0.16 ( $SD = 2.58$ ). As such, the general game performance was poor.

In a range from 0 to 20 the groups went in average 7.94 ( $SD = 5.27$ ) times into the Serengeti for grazing livestock or to poach (Field 13 & 14) during the board game. From five game rounds (related to years) the players in the groups cooperated in 2,94 ( $SD = 0.94$ ) rounds. The participants in average took moderate risks and cooperated moderately. One Tanzanian female player group needed to be excluded, because of unreliable recording during the board game session.



### **Game effect on psychosocial variables**

In general, villagers had high knowledge about contributing something towards the well-being of their community and perceived it as neither easy nor difficult before and after the game play. Protecting nature was seen as neither easy nor difficult, as well. They perceived nature primarily for human use to a high amount. The participants felt a strong connection to nature. Livestock grazing and poaching in the protected areas was perceived as risky. Whereas the expected benefit of livestock grazing were perceived as moderate in comparison with no expected benefit from poaching, but with an increase of expected benefit in poaching after playing the game. Villagers were not sure if they would act out on these behaviors in the protected areas (see Table 1).

Moreover, paired sample t-Tests comparing the before and after questionnaire scores showed that study participants marginally significantly changed their perception of connectedness to nature after playing the board game “Savanna Life” (see Table 1). After the board game, the participants perceived that they were less connected to nature.

Furthermore, study participants changed their perceived behavior control of contributing something towards the well-being of their community and protecting nature after playing the board game “Savanna Life” (see Table 1). The study participants perceived less difficulty to contribute something towards the well-being of their community, next to perceiving that it was less difficult for them to do something to protect the nature around them to a small amount.

**Table 1**

*Paired sample t-Test of the mean differences of the pre- and post- board game scores for the psychosocial variables*

Variable	Mean t1 (SD)	Mean t2 (SD)	t-Statistics	p-Value	Cohen's d
Knowledge of contributing something to the well-being of the community	3.90 (1.14)	3.94 (1.06)	-0.14	0.89	0.017
Perceived behavioral control of contributing something to the well-being of the community	3.21 (1.19)	3.07 (0.95)	1.98	0.052	0.24
Perceived behavioral control of protecting nature	2.89 (1.21)	2.71 (1.20)	1.98	0.052	0.24
Attitude towards nature use	4.25 (1.11)	4.24 (1.29)	0.11	0.92	0.012
Connectedness to nature	4.24 (1.18)	4.07 (1.25)	1.72	0.090	0.20
Risk perception of livestock grazing in protected areas	4.15 (1.13)	4.04 (1.08)	0.68	0.50	0.083
Risk perception of poaching in protected areas	4.54 (1.04)	4.39 (1.26)	0.97	0.34	0.12
Expected benefit of livestock grazing in protected areas	2.97 (1.30)	2.79 (1.29)	0.60	0.55	0.074
Expected benefit of poaching in protected areas	1.03 (1.42)	2.01 (1.43)	-1.25	0.22	0.15
Likelihood of livestock grazing in protected areas	3.28 (1.32)	2.94 (1.40)	1.49	0.14	0.18
Likelihood of poaching in protected areas	2,46 (1.46)	2.60 (1.44)	-0.96	0.34	0.011

### **Prediction of environmentally harmful behaviors**

We used hierarchical regression to test if the variables of the theory of planned behavior explained livestock grazing and, in another analysis, poaching. We first entered attitude towards nature use, the descriptive norm of risk-taking of the group during the game and the perceived behavioral control of protecting nature to predict the likelihood of environmentally harmful behavior in the protected areas. The distal antecedents of attitude were not included because of the small sample size. The model significantly explained 18.9% of the variance of participants likelihood of livestock grazing in the protected areas ( $F_{3,61} = 4.74, p = .005$ ) (see Table 1, Model 1). Secondly, sociodemographic variables were added to this model, but these were not significant predictors .

Similar models were performed to predict the likelihood of poaching in the protected areas, but no significant equation was found (see Table 1, Model 3). Therefore, the hypothesis 2 was partially corroborated.

**Table 2**

Summary of hierarchical regression analysis for variables predicting the likelihood of livestock grazing and poaching in protected areas ( $N = 72$ )

Variable	Livestock grazing in protected areas						Poaching in protected areas					
	Psychosocial variables			Psychosocial and sociodemographic variables			Psychosocial variables			Psychosocial and sociodemographic variables		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
TPB												
Attitude	0.15	0.13	.14	0.023	0.14	.021	0.025	0.14	.022	-0.029	0.16	-.027
Descriptive norm	0.11	0.031	.40**	0.086	0.032	.33**	0.029	0.035	.11	0.018	0.037	.066
Perceived behavioral control	0.27	0.14	.23	0.33	0.14	.28*	0.21	0.16	.17	0.23	0.16	.19
Sociodemographic												
Gender				-0.52	0.38	-.19				-0.41	0.44	-.14
Age				-0.026	0.018	-.20				-0.001	0.020	-.036
Education (years)				0.050	0.039	.15				0.019	0.045	.049
<i>R</i> <sup>2</sup>		.19			.25			.034			.052	
<i>F</i>		4.74**			1.51			0.73			0.36	

Note: Gender was dummy coded (Female = 1, Male = 0), \* $p \leq .05$ , \*\* $p \leq .01$

## **Discussion**

Most studies on environmental behavior aim to provide information, which helps to reduce environmental impact of human activities (Klöckner, 2015). In line with past research this study focused on investigating possible drivers of environmentally harmful behaviors, next to leaning on current research proposing a board game as environmental communication tool to change belief's and through it possibly behavior. We investigated underestimated environmentally harmful behaviors and beliefs towards nature in Africa. Even though there has been some research in conservation, extensive research with social science theories, like the theory of planned behavior, has not yet been well established (Browne-Nuñez & Jonker, 2008; St John et al., 2011). These studies can help with exploring drivers, yet unknown, and can furthermore contribute to decrease the “WEIRD”-bias in social science. Challenges of culture related research are addressed more and with it monocultural measurement techniques get transferred to cross-cultural research (Johnson, 2006). This study contributes to diminish this gap by applying research based on the theory of planned behavior, although the theory itself was not tested due to contextual and practical constrains. First, it was investigated if the board game “Savanna Life” influenced people’s beliefs towards nature, which was examined with the ENED-GEM as a framework. Secondly, it was investigated if attitude towards nature use, descriptive norm of risk-taking and perceived behavioral control of protecting nature predict the likelihood of environmentally harmful behaviors in protected areas, which was examined with the theory of planned behavior. Both assumptions were partly proven. The results and their implications for future research, next to limitation of the study will be discussed in the following section, rounded off with a comprehensive conclusion.

### **Game effect on psychosocial variables**

“Savanna Life” had no measurable effect on the knowledge of contributing something to the well-being of the community, attitude towards nature use, nor on the risk perception, expected benefit and likelihood of the environmentally harmful behaviors in the protected areas in a significant way.

Nevertheless, it showed small changes in the connectedness with nature and perceived behavioral control of contributing something to the well-being of the community and protecting nature.

### **Perceived behavioral control**

As expected, the perceived behavioral control towards contributing something to the well-being of the community and protecting nature changed. Participants perceived acting towards these behaviors as less difficult. This is in line with the ENED-GEM (see Figure 1) and its prediction of an increase of perceived behavioral control towards an environmental-friendly behavior as a learning outcome of playing an educational environmental game. Perceived behavioral control influences the likelihood of acting pro-environmentally friendly (Bamberg & Möser, 2007). Therefore, implications can be that people are more likely to act out on these behaviors in their every-day life. Cooperation and sharing resources are part of “Savanna Life”. Hence, we expect that players with an increase in perceived behavioral control of contributing something to the well-being of the community are more likely to share resources and work load between each other. We also expect that through the increase in perceived behavioral control of protecting nature players feel encouraged to act more pro-environmentally friendly.

### **Connectedness to nature**

When looking at the inclusion of nature in self score we can see that in average the participants felt a strong connection with nature. After the board-game the connectedness to nature decreased in a small amount. “Savanna Life” effected the connectedness to nature, but in an unexpected direction. As mentioned in the introduction, Schultz (2002a, 2011) concluded through his research that in general people feel separated from nature. A reason for the decrease of connectedness to nature could be that through the necessary separation of livelihood strategies and the need of looking at nature not as the surrounding, but as a resource, the perception of the connectedness to nature in the player’s minds changed throughout the game play. Another possible explanation is that because of the individual decision-making processes, people could start to think more about themselves and therefore a feeling of separation from nature arises. Further, the decrease could be due to the different self-concepts. Schultz (2002a, 2011) studies investigated mostly participants from western countries. Therefore, because of different perceptions of self (independent self in western countries vs. interdependent self in eastern countries) and environment related factors (urban environment in the west vs. rural areas in Africa) such counter intuitive results could be explained (Markus & Kitayama, 2010).

### **Prediction of environmentally harmful behaviors**

The descriptive norm of risk-taking during the game was the only significant predictor for livestock grazing in the protected areas. Therefore, it is suggested that the board game could include further strategies to influence the descriptive norm of players for instance through decreasing environmentally harmful behaviors in the protected areas. One solution could be giving the Mzee (player with highest influence in decision-making during game) an underlying mission of not entering the protected areas in the board game. On the other hand, through entering the park, the players can experience the variety of consequences like getting attacked by wildlife, getting caught by a ranger or the loss of natural resources. The downside of having wildlife attacks as negative consequence in the board game could be the increase of the negative attitude towards wildlife which in turn could lead to an increase in wildlife-conflict. We suggest the exploration of this relationship in future research.

Research shows that interventions with the theory of planned behavior as a theoretical background need to be further developed (Browne-Nuñez & Jonker, 2008; St John et al., 2011). Hence, other environmental communication methods could be included in “Savanna Life” e.g. nudging and prompting have been proven as effective environmental communication strategies which increase pro-environmental norms (Klößner, 2015).



## **Limitations and challenges**

Looking at the board game and the effects we can see that some communication techniques have been addressed during the game play and parts of them were effective in increasing control beliefs for the environmentally friendly behavior. Nevertheless, the board game is a complex, new and yet unknown tool in the study of environment of communities close to protected areas. Therefore specific challenges in this area need to be taken into account in future research.

### **Sampling**

In standardize methodology we strive for high randomization and representativeness to achieve valid and generalizable data. Representativeness of the sample is especially important to draw conclusions and inform policy. As in several other studies in Africa this study sample was driven by availability of villagers (Browne-Nuñez & Jonker, 2008). The sample size was modest.

### **Response Bias**

Browne-Nuñez & Jonker (2008) found in their review that the perceived social pressure of the participants is a challenge, which results in responses of participants being biased towards what they “think the researchers want to hear and therefore their answers may not reflect their true beliefs (p. 64)”. Also participants responses may be influenced by the believed origin of the research organization, e.g. when thinking that the researchers are representatives of wildlife authorities, they might fear retribution in a conflict with local communities and wildlife authorities during the game. (Browne-Nuñez & Jonker, 2008). This needs to be addressed in this study, because unknown conflicts between the local communities and wildlife authorities could have been an influence towards the collected responses.

### **Interviewer Bias**

In addition, attention should be drawn to the influence through interviewers’ characteristics, such as appearance, behavior and sex. This is especially important in an African context with researchers coming from abroad (Browne-Nuñez & Jonker, 2008). The example of women in rural areas in Africa is given, where women might feel more comfortable with a female enumerator. Furthermore, suspicion can arise when researchers wear western clothing or clothing that is similar to that of wildlife authorities or exhibit culturally inappropriate behaviors and body language. The interviewer bias was partly eliminated through training sessions and the help and presence of the local community facilitators. However, when working with diverse cultures, the interviewer bias can never be completely eliminated.

### **Cultural Insensitivity**

It must be clarified that cultural insensitivity is an issue that researchers investigating processes in cultural diverse settings need to be aware of (Browne-Nuñez & Jonker, 2008). This ranges from collecting data in rural areas without contributing something towards the local communities, to using western concepts and methods without adapting them to the relevant context (Browne-Nuñez & Jonker, 2008). An important part of culture is language (Guo, 2012) and having the local community facilitators present helped with proper explanation of the game and translation of the questionnaire. Nevertheless, due to several different languages spoken in Kenya and Tanzania, some participants did not understand Swahili and not all community facilitators were fluent in the language Maa. Therefore, language barriers were present and could have led to some misunderstandings during the data collection.

## **Implications for future research**

### **Repeated play**

Repeated play has a lot of value for retention and makes it easier to use the knowledge to apply in practice (Ruben, 1999). It makes it easier to master in-game challenges, which could foster the focus on the actual environmental content. Considering that through repeated play the players manage to master in-game challenges easier, gain more knowledge about the environmental topic and are capable to apply the strategies and knowledge, it can be assumed that repeated play leads to an easier mastering of future challenges. (Fjællingsdal & Klöckner, 2017). Therefore, it is suggested to extend the game play experience in to two sessions and explore the effectiveness of “Savanna Life” after repeated play. Nevertheless, the possibility of participants experiencing cognitive overload increases when playing the games without enough rest in between and different procedures need to be developed. In addition, a follow-up experience after several weeks or months for reflecting on past environmental behavior could also be useful.

### **Narrative transportation**

“Savanna Life” could benefit from a stronger and standardized narrative transportation. The ENED-GEM sees narrative transportation as crucial during the gameplay stage (see Figure 1). In addition, health-research found that individuals motivation can be influenced stronger through an in-game narrative, as compared to didactic instructions on how to act (Lu, Thompson, Baranowski, Buday, & Baranowski, 2012). During the game description each explanation of the enumerators varied slightly and therefore a standardized, validated manuscript in English and Swahili of the “story” of the everyday-life and the possible likelihood strategies of the four families in the village would improve the process. Also experiencing positive and negative consequences, trying different strategies and being in a social setting where players face environmental problems on a short term basis can contribute to reflect positively on the role of social actions (Klöckner, 2015). Embedded in the context with the narrative of the individual story of a family living close to a protected area it could lead to a situated identification and through it changes in environmental beliefs could arise. Nevertheless, the importance of the narrative transportation and individual identification during the gameplay and its outcomes can be investigated in future research.

### **Conclusion**

The board game aimed to foster discussion around different livelihood strategies and their consequences to reduce environmentally harmful behavior. In addition, the present study's central purpose was to evaluate the effect of the game session on villagers and higher-level stakeholders' beliefs and their perceptions towards nature.

After playing the board game, villagers and higher-level stakeholders living close to protected areas in Africa felt less connected to nature, next to perceiving that it was less difficult to do something to protect the nature around them and to contribute something towards the well-being of their community.

Additionally, risk-taking during the game partly predicted the likelihood of environmentally harmful behavior in real life. Addressing Fjællingdals and Klöckners (2017) suggestions to develop a game that “showcase the effects of the player's actions directly on their environment, and simultaneously make the player draw a connection from the game world to real-world application (p. 14)” has been partly implemented in “Savanna Life”.

In conclusion, “Savanna Life” partly influenced a few psychosocial variables and had an unintended effect. It is suggested that it can be more useful in creating a common ground to engage villagers in discussing difficult topics around environmental issues than as a tool that has immediate psychological outcomes.

## References

- Ainley, M., Hidi, S., & Berndorff, D. (2002). Interest, learning, and the psychological processes that mediate their relationship. *Journal of Educational Psychology, 94*(3), 545.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior 1. *Journal of Applied Social Psychology, 32*(4), 665–683.
- Ajzen, I. (2006). *Constructing a theory of planned behavior questionnaire*. Amherst, MA.
- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin, 84*(5), 888.
- Ando, K., Ohnuma, S., Blöbaum, A., Matthies, E., & Sugiura, J. (2010). Determinants of individual and collective pro-environmental behaviors: Comparing Germany and Japan. *Journal of Environmental Information Science, 38*(5), 21–32.
- Arnett, J. J. (2008). The neglected 95%: Why American psychology needs to become less American. *American Psychologist, 63*(7), 602–614. <https://doi.org/10.1037/0003-066X.63.7.602>
- Ballantyne, R., & Packer, J. (2005). Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: What is the state of the game? *Environmental Education Research, 11*(3), 281–295.
- Balmford, A., & Cowling, R. M. (2006). Fusion or failure? The future of conservation biology. *Conservation Biology, 20*(3), 692–695.
- Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology, 27*(1), 14–25.
- Barab, S. A., Gresalfi, M., & Ingram-Goble, A. (2010). Transformational play: Using games to position person, content, and context. *Educational Researcher, 39*(7), 525–536.
- Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD Research, 1*(1), 19.
- Bencin, H., Kioko, J., & Kiffner, C. (2016). Local people's perceptions of wildlife species in two distinct landscapes of Northern Tanzania. *Journal for Nature Conservation, 34*, 82–92.
- Browne-Nuñez, C., & Jonker, S. A. (2008). Attitudes toward wildlife and conservation across Africa: A review of survey research. *Human Dimensions of Wildlife, 13*(1), 47–70.

- Chen, V., Duh, H., Siew Koon Phuah, P., & Zi Yan Lam, D. (2006). *Enjoyment or Engagement? Role of Social Interaction in Playing Massively Multiplayer Online Role-Playing Games (MMORPGS)* (Vol. 4161). [https://doi.org/10.1007/11872320\\_31](https://doi.org/10.1007/11872320_31)
- Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, *59*(2), 661–686.
- Cox, R. (2013). *Environmental communication and the public sphere*. Sage.
- Ehrlich, P. R., & Kennedy, D. (2005). Millennium assessment of human behavior. *Science*, *309*(5734), 562–563.
- Fjællingsdal, K. S., & Klöckner, C. A. (2019). Green Across the Board - What happens to Players of Green Board Games?. Manuscript submitted for publication.
- Fjællingsdal, K. S., & Klöckner, C. A. (2017). ENED-GEM: A Conceptual Framework Model for Psychological Enjoyment Factors and Learning Mechanisms in Educational Games about the Environment. *Frontiers in Psychology*, *8*, 1085.
- Fu, F.-L., Su, R.-C., & Yu, S.-C. (2009). EGameFlow: A scale to measure learners' enjoyment of e-learning games. *Computers & Education*, *52*(1), 101–112.
- Gibbs, C., Gore, M. L., McGarrell, E. F., & Rivers III, L. (2009). Introducing conservation criminology: Towards interdisciplinary scholarship on environmental crimes and risks. *The British Journal of Criminology*, *50*(1), 124–144.
- Gifford, R., Scannell, L., Kormos, C., Smolova, L., Biel, A., Boncu, S., ... Hine, D. (2009). Temporal pessimism and spatial optimism in environmental assessments: An 18-nation study. *Journal of Environmental Psychology*, *29*(1), 1–12.
- Gosling, E., & Williams, K. J. (2010). Connectedness to nature, place attachment and conservation behaviour: Testing connectedness theory among farmers. *Journal of Environmental Psychology*, *30*(3), 298–304.
- Griffiths, M. D. (2002). The educational benefits of videogames. *Education and Health*, *20*(3), 47–51.
- Guo, H. (2012). A brief analysis of culture and translation. *Theory and Practice in Language Studies*, *2*(2), 343.
- Hariohay, K. M., Ranke, P. S., Fyumagwa, R. D., Kideghesho, J. R., & Røskaft, E. (2019). Drivers of conservation crimes in the Rungwa-Kizigo-Muhesi Game Reserves, Central Tanzania. *Global Ecology and Conservation*, *17*, e00522.

- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). Most people are not WEIRD. *Nature*, *466*(7302), 29.
- Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International Journal of Human-Computer Studies*, *66*(9), 641–661.
- Johnson, T. P. (2006). Methods and frameworks for crosscultural measurement. *Medical Care*, *44*(11), S17–S20.
- Kang, J., Liu, C., & Kim, S.-H. (2013). Environmentally sustainable textile and apparel consumption: The role of consumer knowledge, perceived consumer effectiveness and perceived personal relevance. *International Journal of Consumer Studies*, *37*(4), 442–452.
- Klöckner, C. A. (2015). *The psychology of pro-environmental communication: Beyond standard information strategies*. Springer.
- Knapp, E. J. (2012). Why poaching pays: A summary of risks and benefits illegal hunters face in Western Serengeti, Tanzania. *Tropical Conservation Science*, *5*(4), 434–445.
- Krajhanzl, J. (2010). Environmental and pro-environmental behavior. *School and Health*, *21*(1), 251–274.
- Liefländer, A. K., Fröhlich, G., Bogner, F. X., & Schultz, P. W. (2013). Promoting connectedness with nature through environmental education. *Environmental Education Research*, *19*(3), 370–384.
- Lu, A. S., Thompson, D., Baranowski, J., Buday, R., & Baranowski, T. (2012). Story immersion in a health videogame for childhood obesity prevention. *Games for Health: Research, Development, and Clinical Applications*, *1*(1), 37–44.
- Luís, S., Lima, M., Roseta-Palma, C., Rodrigues, N., Sousa, L., Freitas, F., ... Poulos, S. (2018). Psychosocial drivers for change: Understanding and promoting stakeholder engagement in local adaptation to climate change in three European Mediterranean case studie. *Journal of Environmental Management*, *223*. <https://doi.org/10.1016/j.jenvman.2018.06.020>
- Malone, T. W. (1987). Making learning fun: A taxonomic model of intrinsic motivations for learning. *Conative and Affective Process Analysis*.
- Markus, H. R., & Kitayama, S. (2010). Cultures and Selves: A Cycle of Mutual Constitution. *Perspectives on Psychological Science*, *5*(4), 420–430. <https://doi.org/10.1177/1745691610375557>
- Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, *24*(4), 503–515.

- Milfont, T. L., & Duckitt, J. (2010). The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology, 30*(1), 80–94.
- Peng, W., & Hsieh, G. (2012). The influence of competition, cooperation, and player relationship in a motor performance centered computer game. *Computers in Human Behavior, 28*(6), 2100–2106.
- Riemer, V., & Schrader, C. (2015). Learning with quizzes, simulations, and adventures: Students' attitudes, perceptions and intentions to learn with different types of serious games. *Computers & Education, 88*, 160–168.
- Rivis, A., & Sheeran, P. (2003). Descriptive norms as an additional predictor in the theory of planned behaviour: A meta-analysis. *Current Psychology, 22*(3), 218–233.
- Ruben, B. D. (1999). Simulations, games, and experience-based learning: The quest for a new paradigm for teaching and learning. *Simulation & Gaming, 30*(4), 498–505.
- Schultz, P. W. (2001). *The structure of environmental concern: Concern for self, other people, and the biosphere* (Vol. 21). <https://doi.org/10.1006/jevp.2001.0227>
- Schultz, P. W. (2002a). Inclusion with nature: The psychology of human-nature relations. In *Psychology of sustainable development* (pp. 61–78). Springer.
- Schultz, P. W. (2002b). Knowledge, information, and household recycling: Examining the knowledge-deficit model of behavior change. *New Tools for Environmental Protection: Education, Information, and Voluntary Measures, 67–82*.
- Schultz, P. W. (2011). Conservation means behavior. *Conservation Biology, 25*(6), 1080–1083.
- Schultz, P. W., & Kaiser, F. G. (2012). *Promoting pro-environmental behavior*.
- Schultz, P. W., Milfont, T. L., Chance, R. C., Tronu, G., Luís, S., Ando, K., ... Castro, J. (2014). Cross-cultural evidence for spatial bias in beliefs about the severity of environmental problems. *Environment and Behavior, 46*(3), 267–302.
- Sparks, P., Hinds, J., Curnock, S., & Pavey, L. (2014). Connectedness and its consequences: A study of relationships with the natural environment. *Journal of Applied Social Psychology, 44*(3), 166–174.
- St John, F. A., Edwards-Jones, G., & Jones, J. P. (2011). Conservation and human behaviour: Lessons from social psychology. *Wildlife Research, 37*(8), 658–667.
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*(3), 309–317.



- Sweetser, P., & Wyeth, P. (2005). GameFlow: A model for evaluating player enjoyment in games. *Computers in Entertainment (CIE)*, 3(3), 3–3.
- Thøgersen, J. (2009). Promoting public transport as a subscription service: Effects of a free month travel card. *Transport Policy*, 16(6), 335–343.
- Von Essen, E., Hansen, H. P., Nordström Källström, H., Peterson, M. N., & Peterson, T. R. (2014). Deconstructing the poaching phenomenon: A review of typologies for understanding illegal hunting. *British Journal of Criminology*, 54(4), 632–651.
- Vorderer, P., Hartmann, T., & Klimmt, C. (2003). Explaining the enjoyment of playing video games: The role of competition. *Proceedings of the Second International Conference on Entertainment Computing*, 1–9. Carnegie Mellon University.
- Weber, E. U. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). *Climatic Change*, 77(1–2), 103–120.
- Weber, E. U., Blais, A.-R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making*, 15(4), 263–290.
- Zelenski, J. M., & Nisbet, E. K. (2014). Happiness and feeling connected: The distinct role of nature relatedness. *Environment and Behavior*, 46(1), 3–23.
- Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, 25(1), 3–17.

Appendix

Appendix A - Questionnaire

Tafadhali weka alama ya tiki kwenye neno/maneno (namba 1-5) yanayoelezea mawazo yako vizuri kuhusu maliasili.

Please mark your opinion about the statement below on the scale from 1 to 5.

**Maliasili ni kwa ajili ya matumizi ya binadamu.**

*Nature exists primarily for human use.*

1	2	3	4	5
Napinga kabisa <i>Strongly disagree</i>	Sikubaliani <i>Disagree</i>	Sijaamua/sijui <i>Undecided</i>	Nakubaliana <i>Agree</i>	Nakubaliana kabisa <i>Strongly Agree</i>

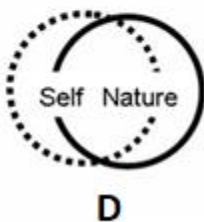
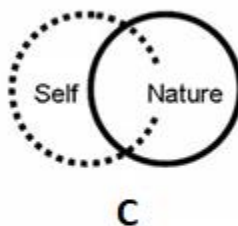
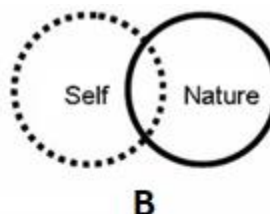
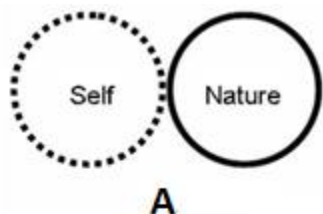
Zungushia picha inayoelezea vizuri uhusiano wako na maliasili inayokuzunguka.

**Mahusiano yako na maliasili yakoje?**

Please circle the picture below that **describes your relationship with the natural environment.**

*How interconnected are you with nature?*

Self = Mimi      Nature = Maliasili



**Onyesha Uwezekano (likelihood) wako, hatari (risk) na faida (benefits) za kujihusisha katika kila tabia zilizoainishwa hapo chini. Tumia namba 1-5 kujipima.**

\*Hatari/janga-ni pale watu wanapojihusisha na tabia/matendo yanayowaingiza kwenye matatizo

*For each of the following behaviors, please indicate your **likelihood, the risk\* and the benefits** of engaging in each of them using the scale from 1 to 5.-*

\*Risk: when people take risks, they engage in behaviors that could lead to **negative consequences**

Benefits = Faida      Risk = Hatari      Likelihood = Uwezekano

**Ujangili katika mbuga za wanyamapori**

*Poaching wildlife in the protected areas*

1	2	3	4	5
Nadra sana <i>Very unlikely</i>	Nadra <i>Unlikely</i>	Sina hakika <i>Not sure</i>	Inawezekana <i>Likely</i>	Inawezekana kabisa <i>Very likely</i>
1	2	3	4	5
Hakuna hatari kabisa <i>Not at all risky</i>		Hatari kiasi <i>Moderately risky</i>		Hatari kubwa sana <i>Extremely risky</i>
1	2	3	4	5
Hakuna faida kabisa <i>No benefits at all</i>		Faida kiasi <i>Moderate benefits</i>		Faida ni kubwa sana <i>Great benefits</i>

**Kulisha mifugo ndani ya hifadhi**

*Letting livestock graze in the protected areas*

1	2	3	4	5
Nadra sana <i>Very unlikely</i>	Nadra <i>Unlikely</i>	Sina hakika <i>Not sure</i>	Inawezekana <i>Likely</i>	Inawezekana kabisa <i>Very likely</i>
1	2	3	4	5
Hakuna hatari kabisa <i>Not at all risky</i>		Hatari kiasi <i>Moderately risky</i>		Hatari kubwa sana <i>Extremely risky</i>
1	2	3	4	5
Hakuna faida kabisa <i>No benefits at all</i>		Faida kiasi <i>Moderate benefits</i>		Faida ni kubwa sana <i>Great benefits</i>

**Tafadhali weka alama ya tiki kwenye maneno yanayoeleza mawazo yako vizuri (Kipimo ni alam 1-5).**

*Please mark your opinion about the statements below on the scale from 1 to 5.*

**Je unafhamu cha kufanya ili familia yako iwe na maisha mazuri?**

*Do you know what to do for the well-being of your family and your village?*

1	2	3	4	5
<b>Sina maarifa</b>		<b>Maarifa kiasi</b>		<b>Maarifa ya kutosha</b>
<i>No Knowledge</i>		<i>Moderate Knowledge</i>		<i>Great Knowledge</i>

Ugumu gani unapata katika **kupata kazi ya kukupatia kipato cha kukuwezesha maisha bora ya familia yako na kijiji kwa ujumla?**

*How **difficult** is it for you to **do something for the well-being of your family and your village?***

1	2	3	4	5
<b>Rahis sana</b>	<b>Rahisi</b>	<b>Si rahisi wala ngumu</b>	<b>Ngumu</b>	<b>Ngumu sana</b>
<i>Very easy</i>	<i>Easy</i>	<i>Neither easy nor difficult.</i>	<i>Difficult</i>	<i>Very difficult</i>

Ugumu gani unapata katika **kuhifadhi maliasili zinazokuzunguka?**

*(Mfano: maji, uoto wa asili mfano nyasi)*

*How **difficult** is it for you to **protect the nature (e.g. grassland, water...) around your village?***

1	2	3	4	5
<b>Rahisi sana</b>	<b>Rahisi</b>	<b>Si rahisi wala ngumu</b>	<b>Ngumu</b>	<b>Ngumu sana</b>
<i>Very easy</i>	<i>Easy</i>	<i>Neither easy nor difficult.</i>	<i>Difficult</i>	<i>Very difficult</i>

**Je tabia ulizoonyesha kwenye mchezo wa mezani ndo maisha yako yako ya kila siku?**

*(Mfano: Ushirikiano na wenzako, kukwepa tabia hatari kama kulisha mifugo ndani ya hifadhi?)*

*Do you show the same behavior that you showed in the game in your everyday life?*

*(e.g. cooperating with others or not, showing risky behavior like grazing your cattle in protected areas or not)*

1	2	3	4	5
<b>Nadra sana</b>	<b>Nadra</b>	<b>Sina hakika</b>	<b>Inawezekana</b>	<b>Inawezekana kabisa</b>
<i>Very unlikely</i>	<i>Unlikely</i>	<i>Not sure</i>	<i>Likely</i>	<i>Very likely</i>

## **Appendix B – Board Game Manual**

### **Savanna Life Board Game**

The board game was developed as a learning tool to enable local households and ultimately communities to evaluate the consequences of livelihood strategy choices and investment and to safely explore alternative strategies. The game also aimed to facilitate actors at different levels of the system to appreciate the constraints, dilemmas and objectives of other actors. This includes the circumstances of livelihoods in local communities and why some households may be forced into poaching and illegal grassing in the Protected Area (PA) and the objectives and possible benefits of complying with policies aiming to conserve natural resources and biodiversity.

The board game follows a constructivist approach simulating life and its challenges in the GSME as it changes over the four seasons of a year. In the game, four players each, take on the role of a local household and face challenges commonly experienced in this area. The seasonal events in a year are repeated five times (years) until at which point a winner is found and the experience of playing the game is explored through a debriefing discussion. By playing the game in different local contexts and with different groups (pastoralists, agriculturalists, females, males, managers, policy-makers and scientists), the game provides insights into stakeholder preferences and behavior that can provide input to conservation and development policy. For the participants in the game, the simulation provides an opportunity to learn from personal experience through the active participation, and the design aims to reflect real life circumstances as accurately as possible within the constraints of a game and thereby enable easily relatable learning outcomes to be transferable players actual context.

However, the game represents a fixed reality with a limited number of options that are more constrained than the number of options available in real life. Furthermore, to provide input for discussion and to facilitate testing of strategies the game deliberately enforces resource constraints not least through population growth and land scarcity and also includes a series of events each year with negative impacts on livelihoods. However, the game also provides options for investment that generates fortune or happiness as it is termed in the game. Hence, the game is not free of being value-laden imposing judgements about what is sustainable or good livelihood strategies including investment in healthcare and education rather than livestock. However, an attempt is made to strike a balance for instance by making it feasible to pursue both of these investment strategies and be successful.

## **Board game design**

Savanna Life is a board game for four adult players. The game can be played in 60-120 minutes. The objective in the game is to achieve a fortunate community for present and future generations by increasing the happiness score, which functions as points gained in the game (Figure 7.1). Fortune can be gained by building businesses, trading goods (formally and informally) and services including by taking wage employment, managing natural resources in the PA sustainably, and by investing in healthcare and education. More specifically sending one child to school or purchasing one unit of healthcare (costing one currency) provides one unit of happiness (i.e. the player moves up one level on the fortune track) whereas livelihood activities only generate food, cash or livestock. Sustainably managing wildlife resources in the PA generates one currency per wildlife unit (maximum of four) to be distributed between players.

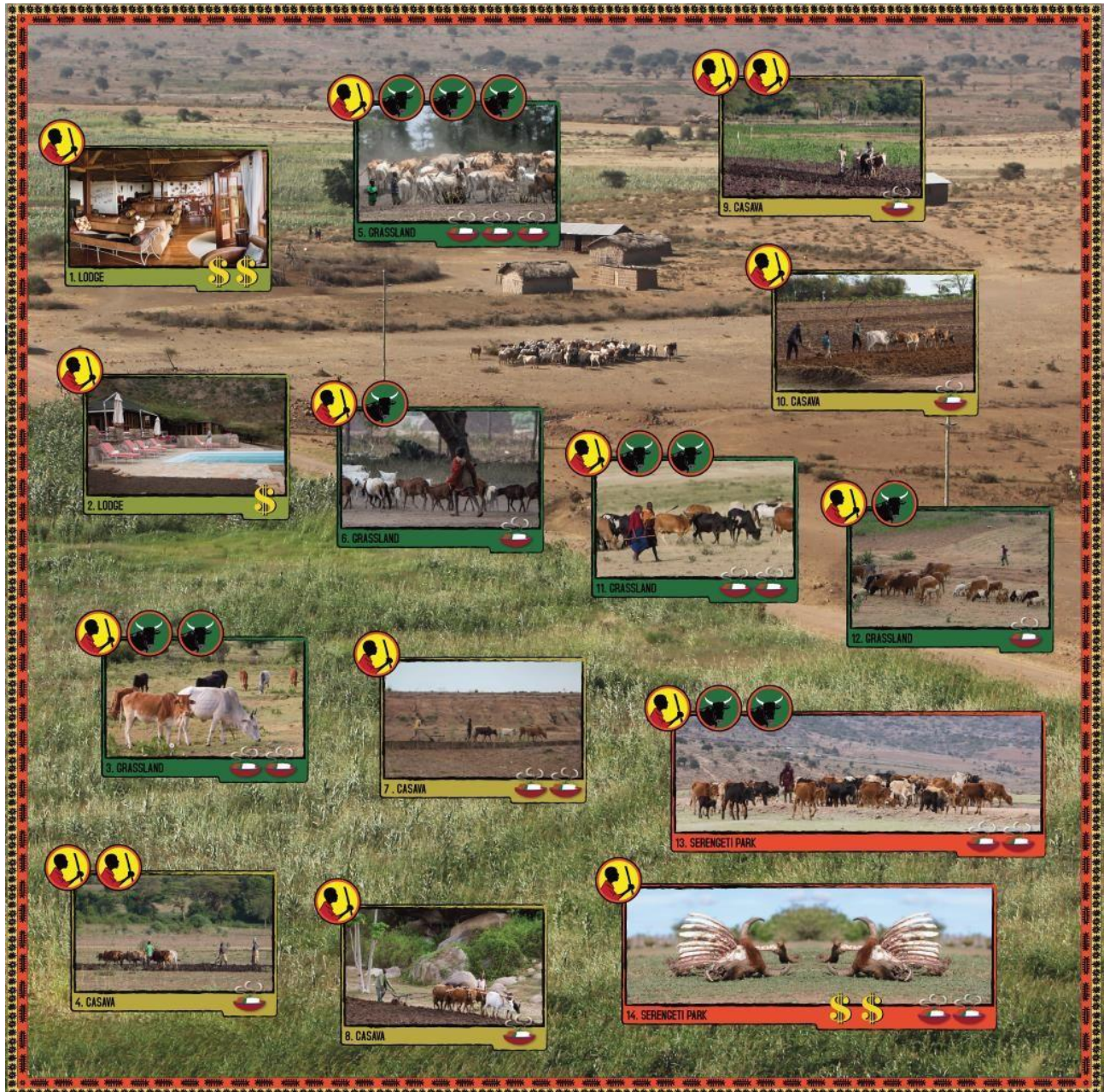
<b>Fortune +10</b>
+9
+8
+7
+6
+5
+4
+3
+2
+1
<b>Start the game here 0</b>
-1
-2
-3
-4
<b>Misfortune -5</b>

player moves down one level on the fortune track). Having livestock that is not brought to a grassland or traded results in its death (i.e. removal from the game). Hunting or grazing in the PA can have negative livelihood implications effectuated through the drawing of a consequence card. Upon entering the PA field on the communal game board (i.e. 13 and 14 on Figure 2), the player randomly draws one of eight consequence cards of which five has implications in terms of being fined one currency or loss of life (household member token removed) and loss of one unit happiness due to wildlife attacks or being shot by a ranger. Drawing one of the remaining three consequence cards implies a successful strategy in terms of food or currency gained. However, for each household member entering the PA either one wildlife unit or one or two grass unit are removed. A player can harvest one wildlife token for each household member token placed in field 14 and one household member token can bring one or two livestock tokens to field 13 consuming one or two grass units, respectively, per turn. Contrary to other livelihoods activities this reduces the resources available next year and also the currency to be distributed between players as annual tourist revenues. However, natural rejuvenation takes place at the end of each year adding one wildlife unit up to a maximum of four and four grass units up to a maximum of twelve. At the end of each year, four event cards are drawn representing events with implications for households in the area. Events include wildlife attacks, drought, and epidemics resulting in loss of livestock or happiness; additional births and urbanization resulting in addition and removal of household members respectively; additional tourist income based on the number of wildlife units in the PA; options for the highest bidding to purchase tractors (generates two food units when used); and changing communal grassland to cassava fields and adding new communal grassing land and cassava fields at cost requiring collaboration and coordination

**Figure 1** Fortune track used for recording happiness score of all players in a game.

The game is also about balancing household members, and food needed to avoid famine, using the ecosystem in an environmentally sustainable way and achieving livelihood resilience. Having more household members than food units generated in a year results in the removal of one unit of happiness for each unit food deficient (i.e. the

between players. Events with negative livelihood consequences may affect all or just one player. The oldest player is appointed Mzee (revered elder in Swahili) at the start of the game. However, after the first year, the player with the most livestock becomes Mzee until the end of that year. The Mzee decides on the distribution of PA revenue, who suffers the consequences of event cards were relevant and generally settles any disagreement.



**Figure 2** Communal board showing fields, number of household members required to use the field, how much livestock it can accommodate, and the output generated from the activity in food units or currency.



By the end of the five years of the game, the player with the most fortune (i.e. highest happiness score) wins the game unless any other player suffers misfortune (i.e. have negative happiness score on the fortune track), in which case the game is forfeit, and everyone loses. Multiple games were played in each location creating a sense of competition across games.

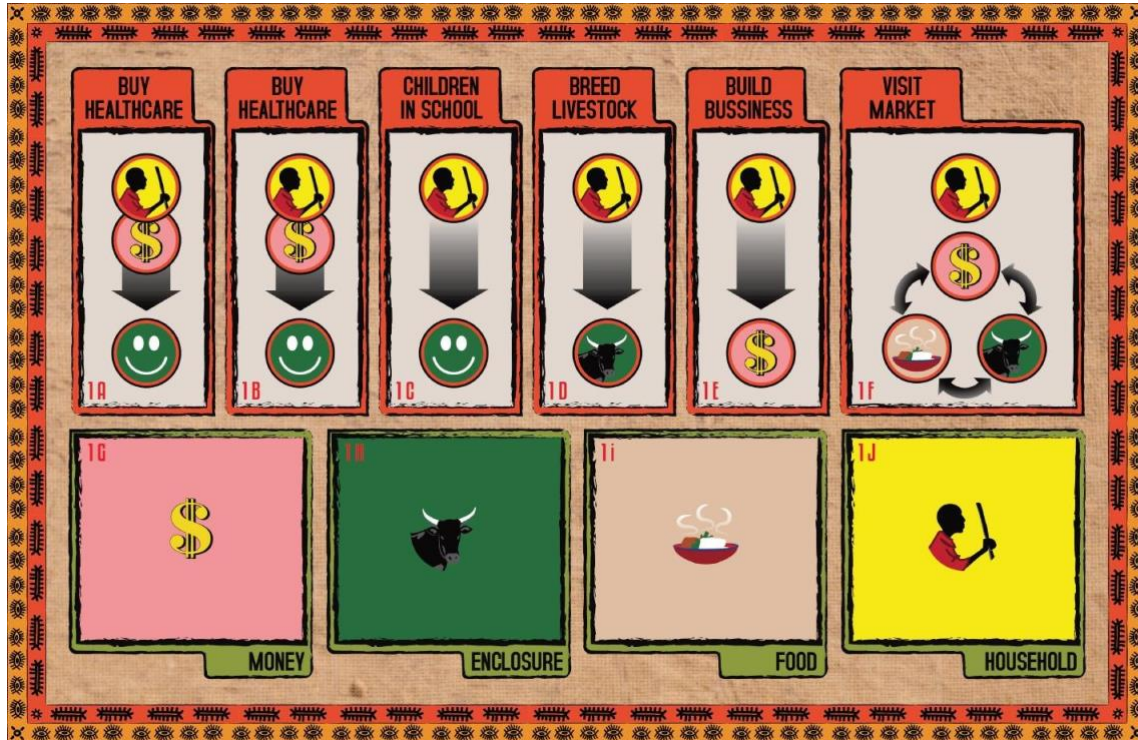
### **Playing the game**

Each player starts out with five household member tokens, three livestock and one currency on their private board (Figure 3). One year has four seasons. The actions undertaken in each season are displayed on a rules summary sheet handed out to each player (Figure 4). The four seasons aims to reflect the seasonal cycle of livelihoods activities and events in the area as much as possible, consisting of a short rain season, a short dry season, a long rainy season and a long dry season.

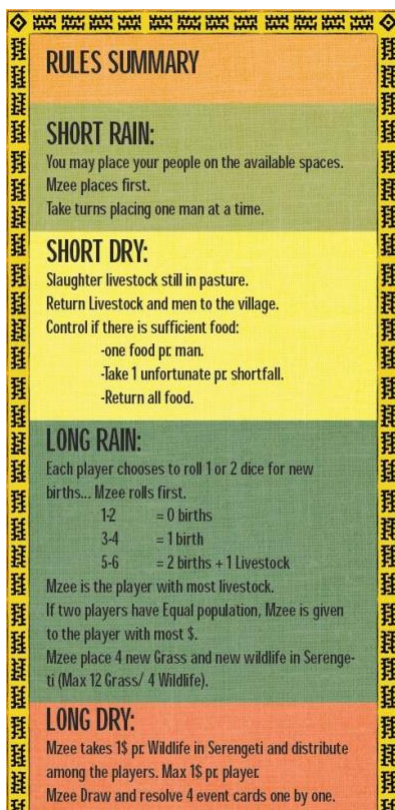
In the short rain season (hereafter “Short Rains”) household members are moved from the household on the private board to undertake livelihood activities generating food and income, and trading goods and services. The players place one household member token on the communal or their private boards in turns, until no more household members are left. Placing a household member token on a grassland field on the communal field requires that the relevant number of livestock accompany it. Occupying a field on the communal board means that other players cannot use this field except fields in the PA that can be used by multiple players until no more resources are left. Other players cannot occupy fields on private boards.

In the short dry season (hereafter “Short Dry”) all tokens (household members and cattle) are returned to the household, and food balance is assessed by comparing number of food units produced or purchase and number of household members. Any deficiencies are recorded by deducting happiness score on the player's fortune track. However, players can engage in collaboration and trade to assist each other and cover deficiencies. Currency can purchase food units from other players but not from the market at this stage. All food units are returned to the bank before proceeding. Year five of the game ends after the short dry season (hence only half a year is played).

# GAMING AS A NOVEL INTERVENTION TOOL FOR CONSERVATION



**Figure 3** Private board of each player, showing fields, number of household members and payment (fields A and B) required to use the field, and the output generated from the activity in food units, currency or happiness. Fields G, H, I and J are start fields.



**Figure 4** Rules and description of board game

In the long rain season (hereafter “Long Rain”) each player rolls a choice of one or two dice to determine the number of household members added through child births. A total count of 1-2 eyes on the dice is equal to 0 children; 3-4 adds 1 child, and 5-6 and above adds 2 children. Reproduction also takes place in the NP through the addition of wildlife and grass.

In the long dry season (hereafter “Long Dry”), the Mzee draws and settles the consequences of four event cards. This season also promotes discussion between players and provides a room for planning.