Vulnerability and Risk Assessment in Botswana's Bobirwa Sub-District: Fostering People-Centred Adaptation to Climate Change

CARIAA
Collaborative Adaptation Research Initiative in Africa and Asia

ASSAR
Adaptation at Scale in Semi-Arid Regions

About ASSAR Reports

This series is based on work funded by Canada's International Development Research Centre (IDRC) and the UK's Department for International Development (DFID) through the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA). CARIAA aims to build the resilience of vulnerable populations and their livelihoods in three climate change hot spots in Africa and Asia. The program supports collaborative research to inform adaptation policy and practice.

Titles in this series are intended to share initial findings and lessons from research and background studies commissioned by the program. Papers are intended to foster exchange and dialogue within science and policy circles concerned with climate change adaptation in vulnerability hotspots. As an interim output of the CARIAA program, they have not undergone an external review process. Opinions stated are those of the author(s) and do not necessarily reflect the policies or opinions of IDRC, DFID, or partners. Feedback is welcomed as a means to strengthen these works: some may later be revised for peer-reviewed publication.

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Funded by:

UKaid
from the British people

IDRC | CRDI
International Development Research Centre
Centre de recherches pour le développement international

Canada

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List of Acronyms

BCA	Botswana College of Agriculture
BOCONGO	Botswana Council of Non-Governmental Organisations
BPC	Botswana Power Corporation
DAR	Department of Agricultural Research
DAP	Department of Animal Production
DCP	Department of Crop Production
DE	Department of Energy
DEA	Department of Environmental Affairs
DRF	Department of Forestry and Rangelands
DGA	Department of Gender Affairs
DHPDME	Department of Health Policy Development, Monitoring and Evaluation
DLSS	Department Labour and Social Security
DMS	Department of Meteorological Services
DM	Department of Mines
DPH	Department of Public Health
DT	Department of Tourism
DWA	Department of Water Affairs
DWUC	Department of Water Utilities Corporation
KCS	Kalahari Conservation Society
NCCC	National Climate Change Committee
NFTRCK	National Food Technology Research Centre Kanye
UB	University of Botswana
UCT	University of Cape Town
UNAM	University of Namibia

Glossary of Terms[1]

Adaptation	Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise.[2]
Adaptive capacity	The ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behaviour and in resources and technologies.[3]
Exposure	The extent to which a social group or a livelihood activity could potentially or theoretically be affected or damaged by the occurrence of a hazard or an issue.
Hazards and Issues	Factors that have an impact on the landscape, both at present and possibly in the future. These include weather and climate change impacts, environmental degradation issues, issues of unequal access to goods and services, and gender and ethnicity related inequalities.
Knowledge Group	The backbone of the VRA, its findings and its analysis. The KG consists of roughly 15 to 25 people with a stake in the socio-ecological landscape in question. The KG should have a strong representation of communities and marginalized groups. The KG will spend two full days together and run through the four steps of the VRA in a roundtable discussion approach. As such, the findings of the VRA are largely the result of this group's thinking.
Landscape	A continually changing, ecologically and socially integrated environment where people pursue their livelihood through different strategies. A landscape includes: 1) different groups of people, some powerful, some living at the margin of society, and their cultural norms; 2) a limited pool of natural resources and the services they provide, to which people have different levels of access; and 3) socio-economic and governance factors, as well as national, regional and global forces affecting it. The Little Sustainable Landscapes Book[4] defines a landscape as a socio-ecological system that consists of natural and/or human-modified ecosystems, and which is influenced by distinct ecological, historical, economic and socio-cultural processes and activities.
Risk	The likelihood, or perceived likelihood, of the materialization of a hazard.

[1] Morchain, D. & Kelsey, F. (2016) "Finding ways together to build resilience - The Vulnerability & Risk Assessment (VRA) methodology: principles, guide and lessons learned". Oxford: Oxfam GB. Available at: http://policy-practice.oxfam.org.uk/publications/finding-ways-together-to-build-resilience-the-vulnerability-and-risk-assessment-593491

[2] European Commission (2016). Climate Action - Adaptation to Climate Change: http://ec.europa.eu/clima/policies/adaptation/index_en.htm

[3] IPCC (2007). Climate Change 2007. In: Parry, M. L., O.F. Canziani, J.P.Palutikof, Linden, P. J. V. D. & Hanson, C. E. (eds.) Technical Summary. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate.

[4] Denier, L., Scherr, S., Shames, S., Chatterton, P., Hovani, L., Stam, N. (2015). The Little Sustainable Landscapes Book, Global Canopy Programme: Oxford.

Sensitivity	The actual impact of a hazard or issue on a social group (or on a livelihood activity) over a set period of time in the past (usually ten years before the VRA is conducted)
Social group	A more or less homogeneous group of people within the landscape, such as 'fisherfolk', 'women agricultural labourers' or 'migrant workers'. For the sake of conducting an assessment of a usually medium-to-large landscape, the VRA will base its analysis on these groups rather than analysing individual or household vulnerabilities.
Vulnerability	Vulnerability is seen as multi-dimensional and understood to be strongly influenced by structural factors, governance systems and inequalities. However, vulnerability is also something that even the most marginalized and poor individuals can act to reduce. While the VRA uses the original Intergovernmental Panel on Climate Change (IPCC) framing of vulnerability, which makes it a function of exposure, sensitivity and adaptive capacity, we analyse each of these three factors holistically beyond a strictly biophysical context. Vulnerability refers to the degree to which people, resources, systems, and cultural, economic, environmental, and social activity is susceptible to harm, degradation, or destruction on being exposed to a hostile agent or factor or hazard.
Risk assessment	A process to identify potential hazards and analyse what could happen if a hazard occurs.

Executive Summary

In November 2015, ASSAR's (Adaptation at Scale in Semi-Arid Regions) Southern Africa researchers from the University of Botswana (UB), University of Cape Town (UCT), University of Namibia (UNAM) and Oxfam, conducted a two-day Vulnerability Risk Assessment (VRA) in order to bring stakeholder groups closer to ASSAR's work. Based on the findings, the aim was to reassess ASSAR's priorities. The workshop was attended by various government officials, Village Development Committee (VDC) members, local community members, and representatives from farmer committees.

The VRA methodology aims at developing a common understanding among various stakeholders, including government officials, village committees and local communities, about the main hazards and issues affecting communities living in a given social-ecological landscape. These stakeholders constitute the Knowledge Group (KG). This engagement was done so as to design measures that reduce risk, enhance wellbeing and promote resilience to hazards in the landscape. There are the four following steps that make up the VRA methodology.

Initial Vulnerability Assessment

During the Initial Vulnerability Assessment (IVA), the main aim is to assess levels of exposure and sensitivity of a social group or livelihood activity to identified hazards and issues. This gives information on who is, and what, is vulnerable and why. The selection of social groups was based on the main livelihood activities and on social differentiation of the Bobirwa sub-district. Following is a summary of the thinking developed jointly by the KG on vulnerability.

Livestock keepers were identified as having the highest level of exposure because FMD directly affects the availability and price of beef. This makes it difficult for livestock keepers to find secure markets outside of Bobirwa sub-district and are therefore mere price-takers, having only a limited geographical and market reach. The KG acknowledged that limited awareness of climate change is a serious issue for those who depend on the land and other natural resources for their livelihood. They indicated that crop farmers are mostly affected by their limited knowledge on climate change.

Crop farmers, again, have the highest level of exposure to high temperatures. The KG also indicated that extreme high temperatures have been increasingly frequent in the last 15 years. There has also been low and inconsistent rainfall. On the other hand, commercial farmers were considered less sensitive to high temperatures as they have resources to construct nets for shade and access to irrigation, in some cases, it was also indicated that commercial farmers have easier access to drought resistant crop varieties.

Livestock keepers were identified as the most sensitive followed by crop farmers. The lack of transport has hindered extension officers to visit and consult with their farmers. This has led to farmers using their own resources. This has also resulted into low guidance by the extension officers hence a low uptake of new forms of farming.

The inability of farmers to undertake adaptive strategies could be seen as vulnerability in and of itself. However, the KG rated the sensitivity as medium as some farmers have been seen to have adopted the new agricultural practices.

Lack of markets suggests that there is low purchasing power. However, a medium value of exposure and low level sensitivity was agreed for food growing farmers. This is because most crop farmers produce for subsistence – and hence don't necessarily benefit from a market at this stage. However, livestock keepers were identified as having the highest level of sensitivity because Bobirwa sub-district is in a Red zone linked to FMD outbreak and because of lack of markets (as indicated in a point above).

Both crop and livestock keepers were considered to be the most sensitive to the lack of access to alternative livelihoods compared to current agriculture-based livelihoods. With rainfall having become increasingly inconsistent over the past 15 years and agricultural production diminished, there is an increased need for people to have access to non-farm based income generation. However, a lack of development planning, the inability to attract investment and chronic poverty have resulted in no such alternatives being available. Commercial farmers were ranked as least exposed as they are not only reliant on one activity but they also practice other forms of income generation such as rearing wild animals in their ranges.

With regard to access and uptake of meteorological data, the KG indicated that in the past weather predictions were inaccurate but this seems to have changed over the years as the information now is more accurate and consistent. The level of exposure was rated as medium to low sensitivity. Meteorological information is being used more and more to inform crop farming.

Drought, lower rainfall and drying of ponds: Both crop farmers and livestock keepers as well as *phane*[5] harvesters were identified as being the most sensitive to drought, lower rainfall and drying of ponds. This is because the lack of water leads to crop failure, cattle death and lack of mopane worms. Threat was indicated as increasing because rainfall patterns have not been consistent over the past 15 years and the frequency and impact of drought have increased.

There is also unequal access to water at the sub-district level. The KG indicated that water scarcity was compounded by drought, low rainfall, ponds drying up and occasional floods. Water scarcity affects all social groups, particularly women who are care givers to all family members at household level.

Impact Chain Exercise

The second part of the exercise was to create a visual tool to represent the consequences of an individual hazard with the Impact Chain Exercise (ICE). This allowed the KG to assess the possible positive and negative future impacts of the identified hazards and issues. The KG was divided into three working groups, each in charge of the following: 1) drought and high

[5] Tswana name for *gonimbrasia belina*, a mopane worm

temperatures; 2) inadequate/lack of agricultural-based alternative livelihoods; and 3) inadequate access to markets.

Adaptive Capacity Analysis

The third stage of the VRA provided an opportunity for the KG members to explore possible solutions and strategies that build resilience and help them to adapt to vulnerabilities identified in step 1 and 2. The last part of the Adaptive Capacity Analysis (ACA) was for the KG to focus on one measure for a specific hazard or an issue. This was done to assist stakeholders in incorporating the adaptive measure into the district development plan. For this exercise, the KG explored different components needed for the successful implementation, including assets base, institutions, knowledge and information, innovation, and flexible and forward looking decision making and governance.

Aligning Findings with Opportunities

As a final step in the VRA process, Aligning Findings with Opportunities (AFO), the KG engaged in an open discussion to identify two key areas for further analysis and development. The discussion focused on what issues need to be addressed and what actions need to be implemented in order to better respond to the priorities identified in the exercise. The areas identified were 1) enhanced engagement of youth in adaptation responses, 2) increased participation of policy-makers and stakeholders, including community members, in identifying problems and proposing solutions together.

Engaging policy makers and achieving change through follow-up actions is vital to ensuring that the VRA successfully supports the resilient development of the chosen socio-ecological landscape. To support this in Botswana the facilitation team explored ways of linking the VRA findings with other national processes.

In Botswana it is customary to discuss issues of development during *Kgotla* (community) meetings. There is a Setswana saying that states "*mafoko a kgotla a mantle otlhe*" which literally translates as "*everything said at a Kgotla meeting is valuable*". The VRA took on this approach as it brought together a diverse range of stakeholders with regards to their gender, age, interest, institutional, sectoral, social, economic and educational backgrounds to discuss ideas and experiences in an open and free manner. The VRA provided a unique platform for detailed discussion and analysis leading to an all-inclusive outcome. The VRA also presented an opportunity to foster collaboration between government officials at district and local levels, and community members and civil society organisations which can, and has previously led, to the design and implementation of sectoral and multi-sectoral strategies. Based on the above, the local government leadership, Assistant District Administrator and the Senior Assistant Council Secretary all hailed the VRA workshop and its outputs as readily usable for the sub-district planning. The leadership committed support for at least another VRA involving participants from other villages of the sub-district.

1. Introduction

The VRA methodology aims to develop a common understanding among a wide range of stakeholders about the main hazards and issues affecting people in a social-ecological landscape and subsequently to jointly design measures to reduce risk, enhance wellbeing and promote resilient development in that landscape. The methodology does so through a participatory process of identification and prioritisation of existing and future vulnerabilities, risks, capacities and ambitions.

The term 'vulnerability' in VRA includes an understanding of the hazards, but also the capacities of people and environment to respond, adapt and overcome these hazards. The VRA brings together actors across scales – community, local, municipal, district and sometimes national – to understand the links between these governance levels. It provides a space for stakeholders to proactively propose ways to move forward and ensure development initiatives are driven by inclusive, locally relevant decision making that benefits the poor and the marginalised. In doing so, the VRA aims to trigger a sense of empowerment and collaboration among stakeholders. While this is a complex process, there is a flexibility that the VRA methodology is instinctively welcoming of; and one that it addresses with a grassroots and exploratory attitude.

The VRA methodology was developed by Oxfam to support communities, practitioners, decision makers and researchers to gain a better understanding of the context of landscapes and the communities and stakeholders that inhabit and depend on them or use them. It also aims to actively and systematically include women in the joint development of an understanding of risks and ways forward - highlighting women's capacities and the unfair structures that enhance their inequality. There is no preferable moment to conduct a VRA; the information it provides can be used to help design a development programme or project; it can serve to highlight issues facing women groups or marginalised ethnic groups; it can be implemented iteratively at different moments in time to assess the evolution of vulnerability for different social groups; it can help raise awareness to government or donors about specific needs in a landscape; among others uses.

This report outlines the findings of a VRA exercise carried out in Eastern Botswana in the village of Bobonong in Bobirwa sub–district in November 2015 in the context of the project Adaptation at Scale in Semi-Arid Regions (ASSAR). The VRA contributes to ASSAR's work on understanding local vulnerability and potential adaptation responses, engaging diverse stakeholders and supporting research into use (RiU) processes.

The Bobirwa sub-district in the Limpopo River Basin is a hot spot in relation to climate change impacts. Cattle rearing and crop production are the dominant livelihood activities in the sub-district. The location of Bobirwa along the borders with Zimbabwe and South Africa makes the district prone to cross border activities such as livestock theft and poaching of wildlife. The poor households in Bobirwa face significant social, economic and political barriers that limit their coping capacity. They are dependent on natural resources such as veld products, basketry, and firewood for their livelihoods that make them particularly vulnerable to climate variability and climate change. Nationally, longevity and the burden of disease is also

negatively affected by HIV/AIDS rates. Bobonong is the largest village in the Bobirwa sub-district and acts as the administrative centre. The village has a population of approximately 19,000 people.

The VRA workshop was held over two days and participants included representatives of central and local government, farmer groups, natural resource users, women traders (vendors), retirees constituting of former government employees and representatives from youth and Non-Governmental Organisations (NGOs). Members of the ASSAR research team from the UB, UCT, UNAM and Oxfam helped to organise and run the workshop. They were engaged in an initial day of pre-workshop activities in Bobonong. See the Appendix for a full list of participants and the agenda of the workshop.

The facilitation team that ran the VRA exercise was composed of Hillary Masundire, Nelly Raditloaneng and Chandapiwa Molefe from UB; Daniel Morchain from Oxfam; Gina Ziervogel, Salma Hegga and Kulthoum Omari from UCT; and Margaret Angula from UNAM.

2. Vulnerability Risk Assessment Methodology

The VRA methodology consists of four steps, including the IVE, ICE, ACA and AFO, and is usually conducted over two days, engaging a wide variety of key stakeholders including community members, government organisations, the private sector and NGOs/CBOs.

A critical task for the facilitation team was to conduct stakeholder mapping prior to the VRA to help ensure an inclusive and representative list of participants is selected for the KG. In this case the VRA research team conducted preliminary stakeholder mapping at the national level in July 2015, which also refers to the local level. A subsequent field visit in November 2015 contributed to forming a clearer picture of the key stakeholders in the Bobirwa sub-district. Selecting the right range of participants helped ensure the relevance, usefulness and applicability of the findings.

The findings from the stakeholder mapping, as well as our vision to represent a wide range of social and livelihoods groups and governance structures, guided the identification of a diverse group of stakeholders in the VRA. From this, 22 representatives were invited to attend the meeting. These included policy makers, government officials, NGOs and representatives of local groups at the sub-district level from the fields of economic planning, poverty eradication, crop production and extension services, wildlife management, environmental health and social and community development. Community members represented basketry and pot makers, pensioners and retirees, farmers, *phane* harvesters, adult education and a church group (Minister's fraternal). Local government and community leader, Umbrella Village Development Committee Chairperson for southern Bobonong, also participated in the meeting. Other community organisations, such as Bobonong Home Based Care Trust, also had their representation.

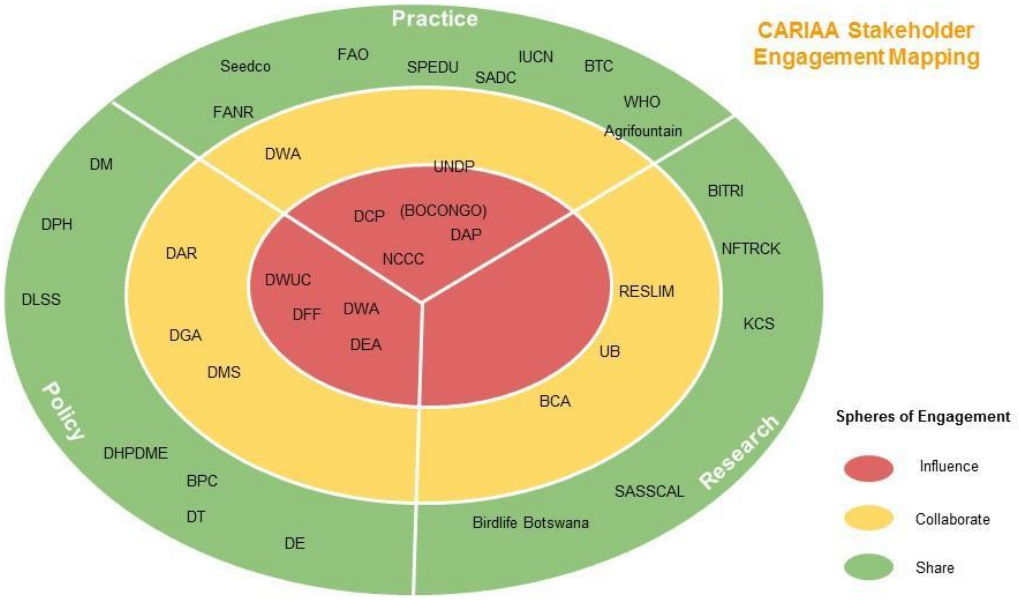

Figure 1. ASSAR Botswana Stakeholder Engagement Mapping

In order to maximise the knowledge shared and value of the outputs produced a series of preparation activities were undertaken by the ASSAR Southern Africa team. This pre-work included a desk-based literature review to gather existing information about the risks already identified and any information about community perspectives. This include reports from the case study site such as the Regional Diagnostic Study (RDS)[6] and mission reports from the introductory visits that took place early in 2015.

A preliminary stakeholder mapping exercise was conducted to help identify power dynamics in the target area. The vulnerable or marginalised people as well as key decision-makers and influencers who should be invited to join the KG, were identified during the exercise. The process was adapted from the analysis conducted in Namibia in July 2015.[7] (Photo 1 and Appendix 2). Preparatory briefing meetings with the KG members were organised in person, by phone and by email to introduce the VRA concept and confirm their attendance at the VRA workshop. The facilitation team also liaised with them regarding logistics and arrangements for the workshop. It was also decided that the VRA would be conducted in Setswana because it was the most inclusive language and helped ensure all participants could actively engage in the session.

To help focus attention on priority issues during the two-day VRA, the facilitation team did an initial analysis to identify key hazards and issues as well as the primary social groups and livelihood activities that were affected by these concerns. The team came up with 15 hazards

[6] ASSAR Regional Diagnostic Study. Vulnerability and Adaptation to Climate Change in the Semi-Arid Regions of Southern Africa. Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA). http://www.assar.uct.ac.za/sites/default/files/image_tool/images/138/RDS_reports/SAFRICA/Southern%20Africa%20RDS%20full%20report.pdf

[7] http://www.assar.uct.ac.za/news/Namibia_RiU_workshop

and issues and 11 social groups; this list was then reviewed, modified and agreed with the KG at the start of the VRA workshop (see Table 1 and Table 2 below).

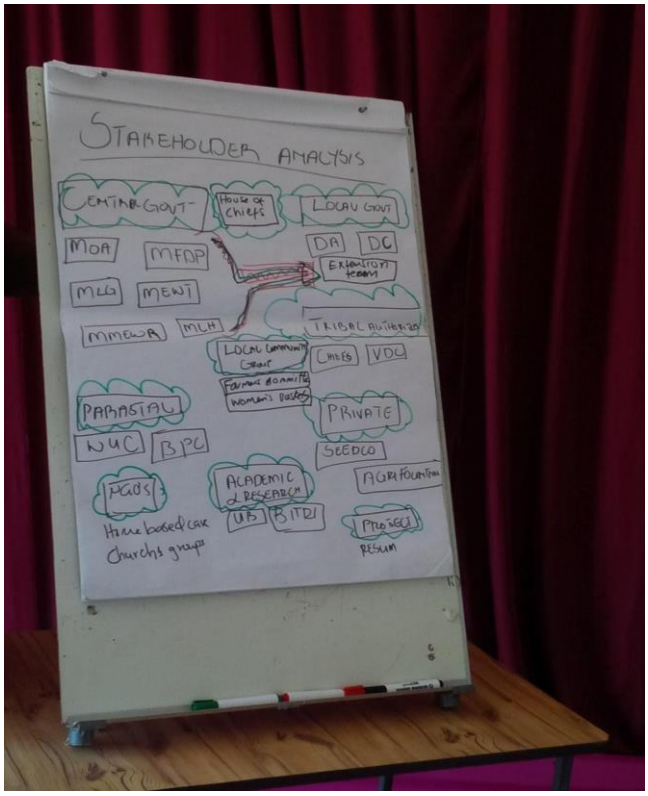

Table 1: Hazards & issues - Bobirwa, Nov. 2015[8]

	Hazard or issue	Justification
1	Drought, lower rainfall, high temperatures and ponds drying up[9]	A common occurrence in Bobonong and a key issue affecting people's livelihoods and wellbeing.
2	Limited access and uptake of meteorological data	Relevant, timely and context specific information and advice from the meteorological service agency does not reach the farmers and communities in general.
3	Limited knowledge about climate change	There is a general lack of awareness about climate change and the risks it poses to the communities and their wellbeing.
4	Foot and mouth disease outbreaks	Most of Bobonong residents keep cattle. FMD outbreaks affect many farmers in the area. This is possibly partly caused by the migration of buffalos from the neighbouring countries into Botswana.

[8] Five hazards, including floods, unequal and unfair access to water at sub-district level, sand mining, livestock theft and cultural and religious beliefs stopping new practices were taken out of the list after voting

[9] High temperatures were incorporated into this issue

5	Limited uptake of new agriculture practices and farming technologies	There is a very low uptake of new technologies and new approaches of farming by the small-scale farmers. New technologies of farming are introduced by the central government and there seems to be no ownership by the local farmers.
6	Poorly resourced agricultural extension services	The agricultural extension officers have inadequate support and therefore they are lacking transport, phones and internet. Local agricultural facilities are also extremely understaffed.
7	Political interference with sound evidence-based planning	At times, politicians change development plans such as agricultural planting approaches and land allocation.
9	Difficult access to markets and the lack of alternatives to agricultural based livelihoods	Insufficient access to institutions that facilitate and promote trade for small-scale producers is prevalent in the sub-district. At the same time, climatic impacts put additional stress on the majority of the population who cannot find alternative employment options to farming in the private

In ranking the above hazards, several statements were made by the KG participants to justify the ranking of climate related vulnerabilities and risks:

- "Heat affects trading. When the temperature is high, traders do less work. Selling in the heat is difficult."
- "For the life in Bobirwa to be complete, livestock rearing is important."
- "We cannot cross the border with *phane* unless we have a permit. Due to the lack of purchasing power, we cannot get good price for our products but for us to sell beyond Botswana, we need a permit for *phane*."
- "Foreigners buy goods at better prices. Others exchange goods for pots."
- "Taxes are a problem. *Phane* is taxed from 10kg upwards. The demand can be high and some people harvest it before it is ripe."

In October 215, the ASSAR research team had identified social groups[10] with the help of stakeholders during field work ahead of the VRA. During the VRA exercise, these social groups were considered in relation to the different hazards. Some social groups are considered being more affected by climate change than others. There are gender disparities and vulnerability is also determined by factors such as class, educational background and sources of livelihood. These social markers can also determine the ways in which different people are able to respond, adapt and build resilience to the impacts of climate change. Emerging from the stakeholder mapping exercise and earlier interviews, a number of stakeholder groups were suggested and these were verified at the start of the meeting.

[10] We consider the clustering of people in social groups to be helpful because it provides an appropriate balance between quality of information that is either too individualized or resource intensive or, on the other hand, too vague or unusable. The understanding obtained from an analysis based on social groups can promote an efficient allocation and use of resources aimed at climate change adaptation, and it can also facilitate upscaling and policy making and implementation.

Table 2: Social groups & Livelihood activities

	Social groups & Livelihood activities	Justification
1	Small scale subsistence crop farmers	The majority of the local community is involved in SS subsistence crop farming. This includes both men and women.
2	Small scale livestock keepers	Keeping cattle is not only a key livelihood strategy but also cultural practice for the people of Bobonong.
3	*Phane* harvesters (mainly women)	There is a large number of *phane* worm harvesters in Bobirwa which has a high importance with regards to income generation.
4	Women traders of vegetable produce	This group is significantly limited in their actions at the moment due to the difficult access to markets. Trading offers potential of becoming a more relevant livelihood activity.
5	Women handicraft (basketry)	Relevant income generating activity for women; at the same time being an alternative to agriculture based livelihoods.
6	Out of school youth (18-35 years old)	A very important group finding few options for making a living in the sub-district. This can result in antisocial behaviour, such as intra-household violence (cases of violence against women and parents described), as well as in creating urban migration problems both in cities and in the sub-district. It should be noted that success stories of migration also exist. This group also offers an educated workforce supply for potential non-farming livelihoods in the sub-district.
7	Retirees	A relatively wealthy and educated group who have retired at around 45. They often have a voice and are generally well respected in the community.
8	Commercial farmers	Irrigated land for livestock and horticulture.
9	Elderly	The elderly make up a considerable percentage of the local community..
10	People depending on welfare programmes and remittances.	High numbers in the sub-district.

The elderly was a special and a unique group as they had both information and problems that other social groups did not have. They were able to articulate their understanding of trends in climate change through examples over their lifetime and this knowledge represented a rich knowledge base of climate related changes over a long time period. This is a useful lesson for future VRAs where it will be important to include the elderly in the exercise in order to understand how the socio-ecological landscape has changed.

For illustrative purpose, we describe five key points that were made by elderly members of the community as the two-day VRA workshop progressed:

1. **Age related vulnerability**
   The KG participants acknowledged that the elderly needed additional care and support because they have age related challenges that affect their daily functioning and purchasing power. The elderly reminded that "E chaile", the time for hard work was over for them and that the Department of Social and Community Services (DSCS) has the mandate to assist every needy group, particularly the elderly with no pension benefits.

2. **Disparities in capabilities**
   The elderly were very concerned about their ability to look after livestock given their declining health and physical capabilities. As one participant said "mowa o thata mme nama e bokoa", which can be translated as "the spirit is willing but the flesh is weak". The increasing temperatures in the summer were a further burden and restricted them to subsistence farming. They did highlight one adaptive strategy called *molaletsa* or *letsema* where they invite and help one another to work on their fields in turns from ploughing to harvesting each other's produce. Women were the key actors in *molaletsa*.

3. **Changing rainfall over their lifetime**
   The elderly said the three patterns of rainfall they experienced as children were no longer dependable. They used to be able to plan their agricultural activities around predictable rainfall; *kgogolamoko* came in August immediately after the harvest season; secondly there was *pula ya sephai* which was the first mark of the rainy season around September; and finally *pula e namagadi* which was fondly likened to a female cow. This was very good rain after which people would plough.

4. **Unsafe drinking water**
   Despite the fact that there were no records of any disease, the elderly believed that the water was not clear and carried water-borne diseases. They also thought that there were multiple water sources in the village because different rivers and wells would be full or dry at the same time.

5. **Youth programmes**
   The Government of Botswana is focusing in initiatives to make business opportunities for the youth through the Youth Fund and other programmes. There is therefore a need to ensure that the welfare state support and development programmes have targeted interventions for young people, adults and the elderly to readdress the varied impacts of climate change.

3. Findings from the Vulnerability and Risk Assessment

3.1 Initial Vulnerability Analysis (IVA)

The purpose of the IVA is to analyse the levels of exposure and sensitivity of a social group or livelihood activity in relation to the pre-agreed key hazards and issues thus achieving a clearer understanding of who and what is vulnerable. Through this process the facilitators aim to support the KG to come to a common understanding of the current hazards and the ones that are likely to pose the highest risk to groups within the community.

The session began by presenting the pre-VRA output of social groups and the major hazards, as identified by the facilitation team. From the original list presented, the KG selected 13 hazards and issues affecting the social groups in the community and also highlighted 10 social groups and their specific livelihoods activities as priority concerns (see Table 3 below).

Table 3: Hazards and social groups identified by the Knowledge Group

Hazards Identified	Social Groups
• Droughts, lower rainfall and ponds drying up • Limited access and uptake of meteorological data • Limited knowledge of climate change • FMD outbreaks • Limited uptake of new agricultural practices and farming technologies • Poorly resourced agricultural extension services • Political interference with sound and evidence-based planning • High temperatures • Cultural and religious beliefs stopping new practices • Livestock theft • Unequal and unfair access to water at sub-basin-level • Difficult access to markets • Lack of alternative to agriculture based livelihoods	• Small scale crop subsistence farmers • Small scale livestock keeper • *Phane* harvesters (mainly women) • Women traders of vegetable produce • Women handcrafters (basketry) • Out of school youth (18 – 35 yrs) • Educated and wealthy retirees with a voice, retired at the age of 45 • Commercial farmers (irrigated land, livestock and horticulture) • Elderly people depending on welfare programmes

Table 4: Voting and ranking output for hazards and issues affecting people of Bobirwa Sub-district

S/N	Hazards identified	Votes
1	Droughts, lower rainfall, ponds drying up	21
2	Limited access to and uptake of meteorological data	6
3	Limited knowledge on climate change	17
4	FMD outbreaks	15
5	Floods	0
6	Limited uptake of new agricultural practices and farming technologies	7
7	Poorly resourced agricultural extension services	6
8	Political interference with sound and evidence-based planning	10
9	High temperatures	11
10	Cultural and religious beliefs stopping new practices	2
11	Livestock theft	5
12	Unequal and unfair access to water at sub-basin-level	7
13	Sand mining	2
14	Difficult access to markets	6
15	Lack of alternative to agricultural-based livelihoods	9

Table 5: Voting and ranking output for social groups in Bobirwa Sub-district, Botswana

S/N	Social groups identified	Votes
1	Small scale crop subsistence farmers	18
2	Small scale livestock keeper	19
3	*Phane* harvesters (mainly women)	16
4	Women traders of vegetable produce	19
5	Women handcrafters (basketry)	15
6	Out of school youth (18 – 35 yrs)	12
7	Educated and wealthy retirees with a voice, retired at the age of 45	5

8	Commercial farmers (irrigated land, livestock and horticulture)	10
9	Elderly	7
10	People depending on welfare programmes	13

To identify the final list of hazards and social issues for inclusion in the VRA, the KG team was asked to discuss, vote and rank their priority hazards and issues, and social groups. Figure 3 and 4 are the ranking scores for the identified hazards and issues and social groups in the Bobirwa sub-district.

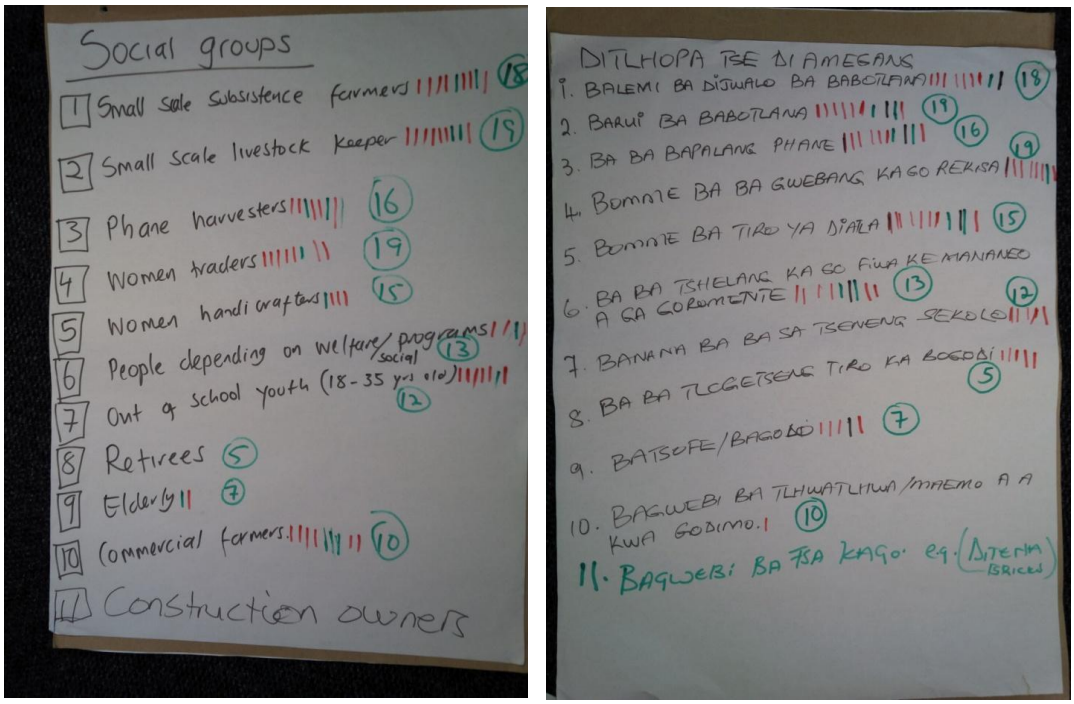

Figure 1. Voting/ranking output for 'social groups' in Bobirwa sub-district, Botswana. Note: On the right is the Setswana version of the social groups

After this exercise, the KG was divided into four groups to work on the hazards and issues that were considered by the KG as most important or pressing. These were 1) drought and high temperatures; 2) FMD; 3) lack of markets; and 4) the lack of alternative sources of living besides agriculture.

3.2 Determining the Vulnerability Score

The next step was to assess the vulnerability of different social groups to a particular hazard or issue. This was done by rating or placing scores of vulnerability, including exposure and sensitivity for each hazard and issue across each of the social groups and livelihood activities. This process required careful facilitation to build consensus and reach a score with which all participants are satisfied. As a group, the KG analysed the exposure and sensitivity of the first two hazards on all the social groups and livelihood activities. The process was taking a long

time, so the KG members were split into three different groups and each group determined the vulnerability of three social groups as identified below:

- Group 1: Crop farming, livestock keepers and commercial farmers;
- Group 2: Phane harvesters, women traders and women handcrafts; and
- Group 3: Social welfare, youth and the elderly

Later, the KG had an opportunity to comment on each group's findings and validated the results. Two different questions were used to guide this step;

1. **To assess Exposure (E)**
   What is the extent to which a social group or a livelihood activity could potentially or theoretically be affected or damaged by the occurrence of a hazard or an issue?

2. **To assess Sensitivity (S)**
   In the past 15 years what has been the actual impacts of a specific hazards, such as droughts, on different social groups, such as the elderly and the farmers?[11]

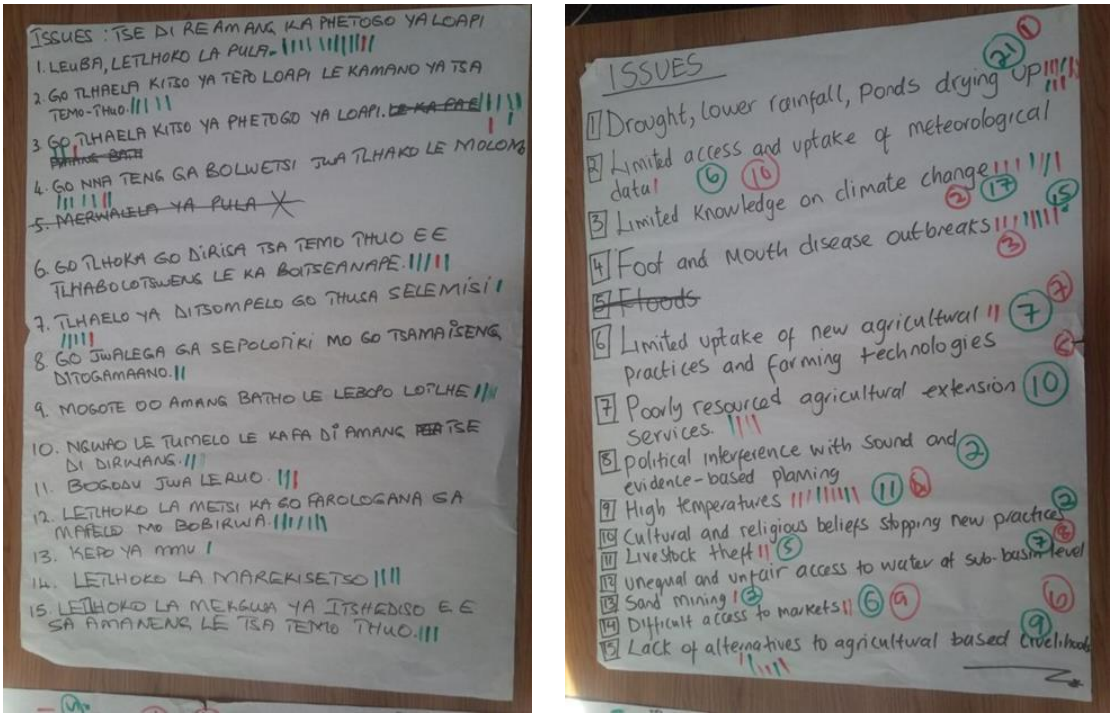

Figure 2. Voting and ranking output for hazards and issues affecting people of the Bobirwa sub-district. On the left is the Setswana version of the hazards and issues affecting people of Bobirwa.

[11] 2000 was used as a baseline year for sensitivity analysis

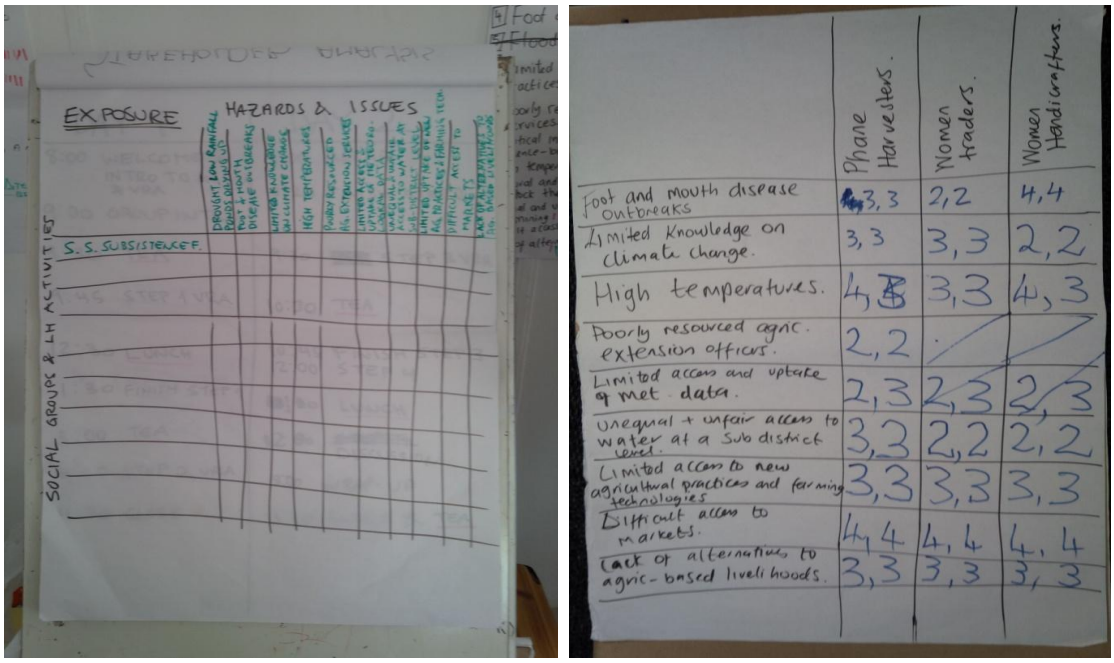

Figure 3. This is the table that was used to fill exposure and sensitivity values of different social groups for all hazards. On the right is the vulnerability score from the *phane* harvesters, women traders and women handcrafts group. The other groups completed the same exercise for their social groups[12]

[12] This group didn't finish their assessment, but only focused on the hazards of most importance and left out those of less relevance to the elderly, hence the missing data.

Table 6: Exposure Table for the identified hazards and issues among different social groups

N/A	Hazard is not relevant to the sector or crop
Low (L)	Some significant exposure is expected
Medium (M)	Medium level exposure expected affecting medium to considerable area of the activity (or medium to considerable number of the sector's facility)
High (H)	Significant level exposure expected affecting a considerable area of the activity (or a considerable number of the sectors facilities)
Very High (VH)	Total area of the activity (or sectors facilities) widely and increasingly exposed to significant climate hazards

	Enter the description of hazard here									
Social group/LH activity	Drought, lower rainfall, ponds drying up	Foot and mouth disease (FMD) outbreaks	Limited knowledge about climate change	High tempera-tures	Poorly resourced agricultural extension services	Limited access & uptake of meteorological data	Unequal and unfair access to water at sub-district level	Limited access & uptake of new agricultural practices and farming technologies	Difficult access to markets	Lack of alternatives to agricultural based livelihoods
Small scale subsistence farmers (crop)	VH	L	H	VH	H	M	N/A	H	M	VH
Small scale livestock keeper	VH	VH	H	H	VH	M	N/A	H	VH	VH

Woman traders	M	M	H	H	M	M	M	H	VH	L
Phane harvesters	VH	H	H	VH	N/A	M	H	H	VH	L
Women handicrafts	M	VH	M	VH	N/A	M	M	H	VH	L
Social welfare dependents	H	N/A	H	H	H	M	M	L	H	VH
Out of school youth (18-35 years old)	VH	L	H	H	H	M	M	M	H	VH
Commercial farmers (livestock and horticulture)	M	VH	M	H	H	L		M	H	H
Elderly	L	H	H					M		

Table 7: Sensitivity Table for the identified hazards and issues among different social groups.

N/A	No negative impact, or some positive impact (*)									
Low (L)	Small impact, with little or no effect on operation/ activity									
Medium (M)	Operation/ activity may be negatively affected to a low or moderate extent									
High (H)	Operation/ activity will be negatively affected to a large extent									
Very High (VH)	Operation/ activity will be fully disrupted									
	Enter the description of hazard here									
Social group/LH activity	Drought, lower rainfall and ponds drying up	FMD outbreaks	Limited knowledge about climate change	High tempera-tures	Poorly resourced agricultural extension services	Limited access and uptake of meteorological data	Unequal and unfair access to water at sub-district level	Limited access and uptake of new agricultural practices and farming technologies	Difficult access to markets	Lack of alternatives to agricultural based livelihoods
Small scale subsistence farmers (crop)	VH	H	H	H	M	L	N/A	M	L	H
Small scale livestock keeper	VH	VH	VH	H	M	L	N/A	H	M	H

Woman traders	M	M	H	H	M	H	M	H	VH	L
***Phane* harvesters**	H	H	H	H	N/A	H	H	H	VH	L
Women handicrafters	M	VH	M	H	N/A	H	M	H	VH	L
Social welfare dependents	H	N/A	M	M	L	H	M	L	M	M
Out of school youth (18-35 years old)	VH	L	M	M	M	H	M	M	M	H
Commercial farmers (livestock and horticulture)	M	VH	M	H	M	L		M	M	M
Elderly	M	M	H					L		

***Scoring Methodology:* The score ranges from 1 (lowest), 2 (medium), 3 (high) and 4 (very high). The first score on each box represent values for exposure and the second score represent values for sensitivity e.g. a score value of 4.3 on the third column (high temperature) and first column (phane harvesters) of Figure 7 represents a very high level of exposure (4) and high levels of sensitivity (3) among the phane harvesters to high temperature.**

3.3 Exposure and Sensitivity Analysis

The thinking behind the assessment of exposure and vulnerability for the selected hazards and issues is discussed below. The values of exposure and sensitivity are encoded using the table below to calculate the vulnerability scores for each social group. In the analysis, the exposure is mark as E and the sensitivity as S. This system is based on the follow structure; initial vulnerability values go from green lowest levels increasing through yellow and orange to the highest levels of vulnerability in red.

Table 8: How exposure and sensitivity values are combined to show the initial vulnerability value. Initial vulnerability values go from lowest levels (green), increasing through yellow and orange to the highest levels of vulnerability (red).

	SL	SM	SH	SVH
EL	L	L	M	M
EM	L	M	H	H
EH	M	M	H	VH
EVH	M	H	VH	VH

3.3.1 Foot and Mouth Disease

When assessing the exposure and sensitivity of the social groups, the highest value of exposure and sensitivity was given to livestock keepers (E: very high, S: very high) because FMD directly affects the availability and price of beef. In addition, the KG highlighted that, due to the threat and the outbreaks of FMD, it is difficult for the livestock keepers to find secure markets outside of Bobirwa. Therefore most of the trade is done within the sub-district territory. As the livestock keepers cannot sell their cattle outside the FMD zone, they cannot fetch reasonable prices.

Horticultural farmers and farmers farming arable land were identified to be less exposed to FMD (E: low) but they were considered sensitive (S: high) because of their indirect dependency on animals for activities like ploughing. For the category of commercial farmers, high-level exposure (E: very high) was agreed based on their historical experience. Despite commercial farmers having a large number of cattle, they still cannot sell them if the FMD occurs (S: very high). In addition, the compensation provided for the loss of cattle during an outbreak is insufficient. The KG recalled that in 2009 the government culled the cattle and only paid 500 Pula[13] per cattle as a refund. The final group, out of school youth were determined to have no significant exposure (E: low) because youth only engage in small livestock.

[13] 500 Pula = roughly to USD 45 as per November 2015

3.3.2 Limited Knowledge of Climate Change

The KG members acknowledged that limited awareness of climate change is a serious issue for those who depend on the land and climate for their livelihoods. Food growing farmers and livestock keepers had the highest exposure (E: very high). Reflecting on the challenges of using new knowledge, the KG members added that sometimes farmers are not willing to apply new knowledge and skills even if this knowledge is available. The challenge of row planting versus scattered/broadcasting is an example.

Further investigation is needed to understand why farmers are unwilling to adopt the advice given by field assistants and extension officers, and the strategies should be developed to support the learning process and encourage changes in behaviour. Sensitivity is assessed as high (S: very high or S: high) for the majority of groups. For example, farmers still often plant maize when they could plant sorghum, which is more tolerant to dry conditions.

For commercial farmers, the agreed values were only medium because they have access to more formal knowledge systems and appear to maintain strong businesses. The KG felt social welfare dependents had high levels of both exposure and sensitivity because they frequently participated in poverty eradication programmes such as backyard gardening. They are often highly dependent on the impacts of climate change and rarely have an alternative safety net.

3.3.3 High temperatures

The KG felt that the temperatures have become increasingly extreme in the last 15 years. Coupled with low and inconsistent rainfall the weather poses a serious threat to the social groups in the area. Food growing farmers (crop farmers) were considered to have the highest exposure and sensitivity (E: very high, S: high) followed by livestock farmers (E: high, S: high) because the KG knew that crops have been frequently dying in the heat. The health of the farmers themselves is also affected by increasing blood pressure in the extreme heat. The crops are more likely to succumb to outbreak of disease when farmers cannot attend to them because of the impact of extreme temperatures.

Due to more evapotranspiration and increased water demand, temperatures have also indirectly contributed to the drying up of boreholes and riverbeds increasing cost of pumping water. This has particularly affected the productivity of the kitchen gardens of social welfare dependents (E: high, S: medium) as the water supply is low. Commercial farmers were considered less sensitive because they have constructed nets to shade their crops and have easier access to drought resistant varieties.

3.3.4 Poorly resourced extension services

The consequences of the lack of extension services were the most acute for livestock keepers (E: very high, S: medium) and crop farmers (E: high, S: medium). The KG felt services had dwindled over the last 15 years and were particularly bad at present due to lack of transport for government staff who cannot visit their area regularly. The consequences include farmers

having to use their own reserves to cover items that should be provided by the government; whole seasons passing with no crops planted as the tractors are waiting for repair; and the lack of visits by extension workers during ploughing season meaning advice and guidance cannot be sought during this critical time. Low exposure and moderate sensitivity value (E: high, S: medium) was agreed on for commercial farmers because they have their own transport and can collect extension service officers to take them to and from their fields at their own cost. For the youth category, a significant level of exposure was expected (E: high) because there was no poultry nor a small-stock officer in the area. Local farmers have to travel to Selebi Phikwe to get support from an extension officer.

3.3.5 Limited access and uptake of new agricultural practices

Drought and water scarcity are closely linked to crop failure, infertile soils and poor animal health. This highlights the need to adopt new agricultural practices such as the introduction of high breed crops, modern methods of farming and the use of underground water to irrigate farms. The inability of farmers to adopt these types of adaptive strategies could be seen as affecting their vulnerability.

Compared to the historic averages, low yields due partly to reduced rainfall, left both crop farmers and livestock keepers significantly exposed (E: high). For crop farmers, the KG rated their sensitivity to be medium (S: medium) because they have seen some changes in how farmers are including new agricultural practices. For example, people are adapting to new ways of ploughing. A medium exposure and moderate sensitivity value (E: medium, S: medium) was agreed on for commercial farmers because they are more receptive to new technologies. An important note from the KG was that current seasonal climate forecasting support is not always helpful or relevant for Bobonong, because the forecasts are not specific enough.

3.3.6 Difficult access to markets

The lack of market access suggests low purchasing power, lack of effective advertising of products and low interest in the products. Other challenges include extra costs of transportation, time and financial constraints and the overall lack of sustainable markets linked to a weak supply chain. A medium value for exposure (E: medium) and low-level of sensitivity (S: low) was agreed on for food growing farmers because they are only producing for subsistence and for seeds in the next planting season. For the livestock keepers, a high-level exposure (E: very high) was captured with moderate sensitivity (S: medium) because Bobirwa sub-district is in a red zone linked to the FMD outbreak which is likely to directly affect the market for beef. A high level exposure (E: high) was selected for commercial farmers. The lack of market access for their products mean the produce can get spoiled before they are consumed.

3.3.7 Lack of access to alternative livelihoods (compared to current agriculture-based livelihoods)

Both crop farmers and livestock keepers were considered the most exposed to this hazard (E: very high), because their livelihood options are solely based on rain-fed agriculture. Furthermore, their sensitivity is assessed as high (S: high) because the rainfall has become increasingly inconsistent over the past 15 years. Their livelihoods therefore continue to worsen with no alternative income generation activities and food sources available. Furthermore, the KG noted that most of the livestock farmers are also crop farmers. Hence, any changes that affect crop farmers also affects livestock farmers. For the category of commercial farmers, a high level of exposure (E: very high) was expected and a moderate sensitivity (S: medium) was agreed upon because commercial farmers are not reliant on one activity as they often have wild animals in their range that they can also use.

For young people the lack of alternative livelihoods is a significant cause of poverty and vulnerability (E: very high, S: high). The consequences can include: large numbers migrating to urban areas in search of real, or imagined, employment opportunities; and an associated loss of skilled and able labourers to work on rural fields. As a result, the elderly, men and women, are then left in the villages looking after grandchildren which adds to the burden on them and restricts their ability to learn and adopt new coping strategies.

3.3.8 Limited access and uptake of meteorological data

The KG agreed that in the past farmers and livestock keepers were informed about seasonal climate projections but they did not take the information seriously because of regular inaccuracy. However, now the information is more consistent and people follow the advice, therefore they only selected medium-level exposure (E: medium) and low sensitivity (E: low). For commercial farmers no significant exposure (E: low) was expected with small or no operational impact at all (S: low).

3.3.9 Drought, lower rainfall and drying of ponds

The highest level of exposure (E: very high) and sensitivity (S: very high) was expected for crop farmers, livestock keepers and *phane* harvesters because the lack of water increases the likelihood that their crops might fail or animals might die. The KG felt this threat was increasing because rainfall patterns had not been consistent in the past 15 years and the frequency and impact of drought had increased.

They also highlighted that livestock farmers warranted high ratings because they were not able to migrate with their animals in search of water because of the threat of livestock theft. Traders were thought to be moderately affected (S: medium) because some items will become scarce in a drought and households may have less income to spend on purchases.

The KG felt it necessary to rate the youth category as highly exposed and sensitive (E: very high, S: very high) because when drought occurs families do not need their assistance in the

fields or to harvest *phane* thus the youth might get into trouble. In addition, youths who took loans for agricultural business cannot pay them back during a drought resulting in further hardship. When there is a drought the elderly have to use their old age grant for food instead of other vital supplies and services thus they can be seen to be more sensitive to drought impacts (S: medium). This is worsened by their physical fitness making them predisposed to higher sensitivity.

Due to the diversity of their produce, commercial farmers are not seen to be as affected (E: medium, S: medium) because there is always something to sell even during a bad season. The KG did acknowledge that the lack of rainfall would decrease the amount of drinking water for livestock and lead to weight and profit losses when sold both in the local market or any abattoirs of the Botswana Meat Commission.

On a more general note the KG highlighted that the social consequences of the loss of livelihood due to drought can be far reaching as people adopt risky behavior, including drug and alcohol abuse, truancy, criminal activities, theft and corruption, which can all lead toa family breakdown or a death in the family. It can also increase the scale and impact of disease and malnutrition.

3.3.10 Unequal access to water at the sub-district level

Unequal access to resources and to decision making, alongside with an already vulnerable natural resources base, can lead to significant vulnerability related to access to water. Furthermore, an inability to claim rights to safe water can lead to the use of contaminated or dirty water which in turn can cause water borne diseases such as malaria, cholera, diarrhoea, and schistosomiasis.

The KG identified two key geographical areas, Damujenna and Lepokole, where unequal access to water increases vulnerability. The KG also highlighted that the water quality was compromised by electricity outages even though the quality was within acceptable limits not to cause water borne diseases. The problem of water scarcity was compounded even more by drought, low rainfall, dry ponds and occasional floods. Water scarcity hits hard on all social groups, particularly women who are also caregivers to all family members at household level, including child rearing. Women and children are therefore disproportionately affected by problems of water scarcity. Medium level exposure (E: medium) was allocated to social welfare dependents in these areas as they have little access to water to support activities like backyard gardens. The most exposed villages highlighted by the KG were Tsetsebje, Mathathane and Lepokole.

3.3.11 Summary of identified vulnerabilities

Beyond the individual hazards and social issues identified above it is worth noting that these do not exist in silo but often interact, reinforce and compound one another so that social groups experience a convergence of vulnerabilities. We also see secondary risks developing from the initial ones listed above.

An example would be that gender inequality and responsibilities interact with poor rainfall to increase the burden on women both in terms of time and distance to access water, increased stress linked to inability to provide water for domestic and childcare tasks as well as most acutely damaging subsistence farming livelihoods, of which the majority are women, which don't have access to commercial irrigation techniques. This means that crop failure, though bound to affect every farmer, hits women the hardest. Drought and poor yields have a serious impact on childhood malnutrition. The lack of a national food security system both threatens children's health and negatively impacts one of women's key socio-culturally defined roles. In addition, the time burden to obtain supplementary feeding in public health facilities, further takes women away from their homes and other duties.

The table 9 illustrates the auto-calculated vulnerability score for each social group and livelihood activity against each hazard and issue in the Bobirwa sub-district. More red the score is, the greater is vulnerability (scores = 0) of the social group and livelihood activity to a hazard, while green scores represent lesser vulnerability (scores = 3). Using this information, the KG identified five major issues for further analysis: drought; FMD; high temperatures; difficult access to market; and the lack of alternatives to agriculture based livelihoods.

The final step in the exposure and sensitivity analysis was for the KG to shortlist their priority concerns based on which ones were likely to bring the highest levels of vulnerability to the different social groups in their landscape. Consideration for prioritisation was based on the frequency, intensity and magnitude of impacts in the last 15 years. The group selected the following three top issues[14] to work on in the next two exercises - ICA and ACA:

- Group 1 - drought, lower rainfall and high temperature
- Group 2 – difficult access to markets, and
- Group 3 - lack of markets and the lack of alternative agriculture based livelihoods.

The nexus of drought, low rainfall, high temperatures, water scarcity, poor water quality, crop failure, food insecurity, low purchasing power, and climate related illnesses were found to affect the Bobirwa communities in a cyclical manner with one problem often linked or leading to many others.

[14] Due to time constraints the KG was split into three sub-groups and issues of a similar or overlapping nature were merged to allow them to be discussed during the ICE.

Table 9: Vulnerability score for Bobirwa sub-district

Hazard Description										
Social group/ LH activity	**Drought, lower rainfall, ponds drying up**	**Foot and mouth disease (FMD) outbreaks**	**Limited knowledge about climate change**	**High temperatures**	**Poorly resourced agricultural extension services**	**Limited access & uptake of meteorological data**	**Unequal and unfair access to water at sub-district level**	**Limited access & uptake of new agricultural practices and farming technologies**	**Difficult access to markets**	**Lack of alternatives to agricultural based livelihoods**
Small scale subsistence farmers (crop)	VH	M	H	VH	M	L	N/A	M	L	VH
Small scale livestock keeper	VH	VH	VH	H	H	L	N/A	H	H	VH
Woman traders	M	M	H	H	M	H	M	H	VH	L
Phane harvesters	VH	H	H	VH	N/A	H	H	H	VH	L
Women handicrafts	M	VH	M	VH	N/A	H	M	H	VH	L

Social welfare dependents	**H**	**N/A**	**M**	**M**	**M**	**H**	**M**	**L**	**M**	**H**
Out of school youth (18-35 years old)	**VH**	**L**	**M**	**M**	**M**	**H**	**M**	**M**	**M**	**VH**
Commercial farmers (livestock and horticulture)	**M**	**VH**	**M**	**H**	**M**	**L**		**M**	**M**	**M**
Elderly	**L**	**M**	**H**					**L**		

3.4 Impact Chain Exercise (ICE)

This exercise allowed the KG to assess the possible positive and negative future impacts of the identified hazards and issues. The ICA is a visual tool to represent the consequences of an individual hazard. By taking a forward looking, systemic lens this process should identify both direct and indirect/subsidiary consequences. The ICA should help outline how vulnerability propagates through a system and illustrate the potential impacts over the coming decades.

Group 1 worked on the drought ICA and highlighted five direct impacts to different sectors/livelihood activities;

- reduced water and grass for grazing in livestock sector;
- reduced yields and low fodder production for crop production;
- reduced *phane* harvesting for *phane* harvesters;
- reduced number of wildlife for tourism and wildlife sector; and
- reduced water supply for fishing and factories.

This list was compiled based on the KG reflections that these livelihoods are highly impacted by rainfall patterns and increasing temperatures e.g. reduced grass for grazing and inadequate water affects livestock health and fertility rates, less rainfall reduces yield volumes and subsequently affects farmers earnings. The consequences of this can include; lower income leading to inability to pay for vital services like healthcare or children's school fees; children out of school participating in risky behavior like drug use; outmigration of men in search of alternative sources of income and overall increases in household conflict; and stress and family break-up (see figure 10 below for further detail). It is also important to note that the varying ability of people to enjoy their rights as well as their different levels of access to resources - partly originating in their gender - play a critical role in determining their vulnerability. For instance, the KG concluded that access to water is largely determined by social factors.

The KG members reflected that drought is the cause of many livelihood problems; "no rain, no grass, no grazing, no "*mokolwane"* palm, *Hyphaene petersiana,* that is used for basketry, high temperatures, harsh effects on and death of livestock, reduced livestock products, reduced livestock fertility." One of the male participants said "We rear livestock for both consumption and income. We can't sleep if we lose our livestock. We have no income for school fees, hence school dropouts, poor school attendance, and no payment of daily bills."

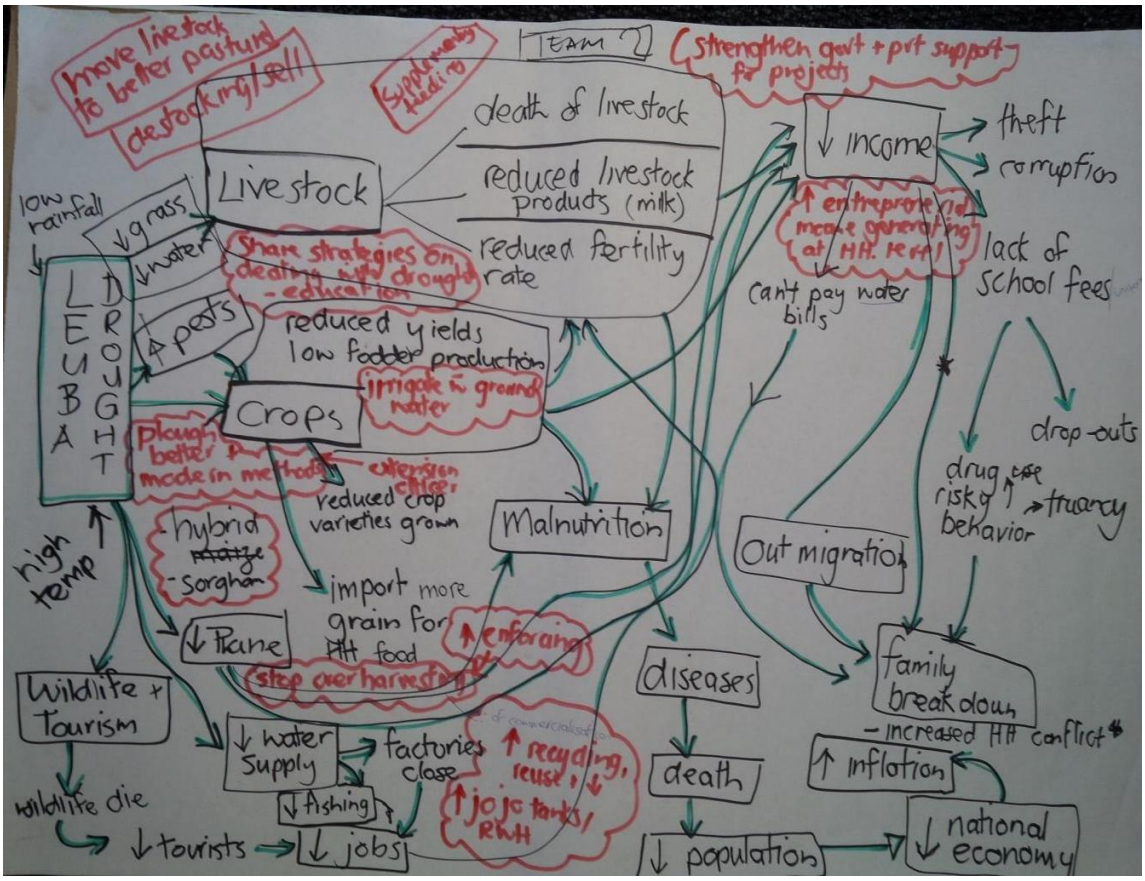

Figure 4. ICE for drought (group 1)

Group 2 undertook an ICA to explore the impacts of inadequate alternatives to agriculture based livelihoods. They identified 3 direct impacts:

1. few options for income generation combined with insufficient own food production result in hunger/malnutrition;
2. reduced income for livestock keepers; and
3. increasing number of out of school unemployed youths and the possible destructive behavior resulting from it.

Participants in this group highlighted that the lack of alternative livelihoods increases the number of out of school youth who are unemployed which can lead to issues like alcoholism and migration to cities which they believe often leads to engagement in negative behaviors such as substance abuse, crime, prostitution and exposure to HIV/AIDS. These activities endanger the future of the next generation and cause increased stress/burden on parents.

As one member put it “in the village like Bobirwa, youth migrate to find jobs...it would have been better if the jobs were here so they didn’t have to move to cities” and another mentioned “if the youth become pregnant they come back to the village and leave children with grandparents which is not good for grandparents”. This led to a wider discussion about incidents of teenage pregnancy and increased illegal and unsafe abortions and child dumping rates which they believe is linked to social instability, high school drop outs and unemployment amongst young people.

The lack of access to alternative livelihoods activities was also identified as a concern for agriculture-based livelihoods such as small scale crop farmers and livestock farmers. Their limited options coupled with climate change impacts, which are reducing the viability of their current agriculture activities, leads directly to decreasing food production and household food consumption as well as reduced income from agricultural activities.

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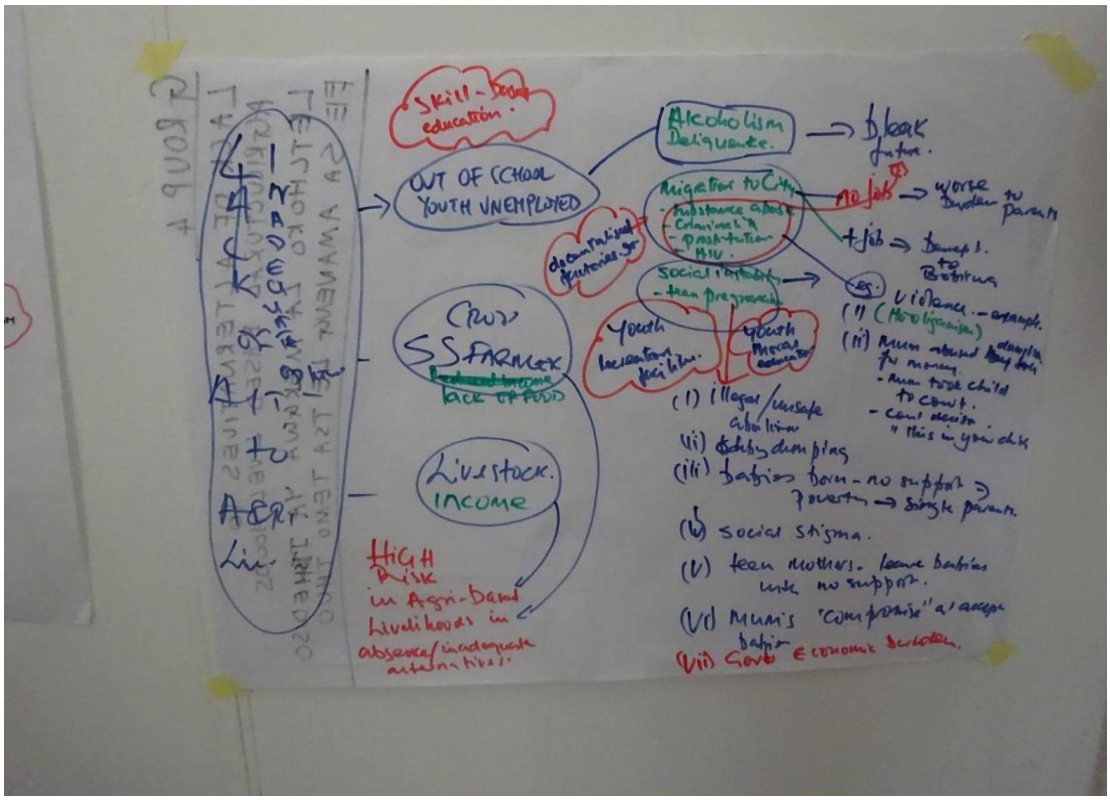

Figure 5. ICE for lack of agricultural alternative livelihoods (Group 2)

Group 3 then explored the issue of lack of access to markets. The KG highlighted that this is partly a result of Foot and Mouth Disease (FMD), low quality of products, lack of education in determining markets, poor/lack of advertising skills, people's interest in the products and the quantity and sustainable supply. This group identified three direct impacts:

1. Extra cost of transportation in terms of time and finance in finding new markets;
2. Expiry of perishable goods and services before they reach the final consumers can lead to reduced markets (and sometimes collapse of the business); and
3. Increased need for welfare programmes.

The KG highlighted a serious concern was the expiry of perishable goods and services because this affected the flow of market products and led to uncertainties in supply vs demand. Uncertainties in the supply chain lead to a lack of confidence from both supplier and customer. Another concern raised by members of the KG was that searching for alternative markets can lead to increasing transportation costs, longer time burden and the threat of theft and attacks (especially among women traders who are walking long distance to reach alternative market centres). Furthermore, unstable or closing businesses creates unemployment and loss of

income for others and both can lead to increasing conflicts at the household level such as divorce and domestic violence. Indirect consequences of the loss of household income include: children leaving school which is further linked to teenage pregnancies; and engagement in undesirable livelihood options such as sex work (which increase STDs, HIV and AIDS); and greater dependency on social welfare programmes.

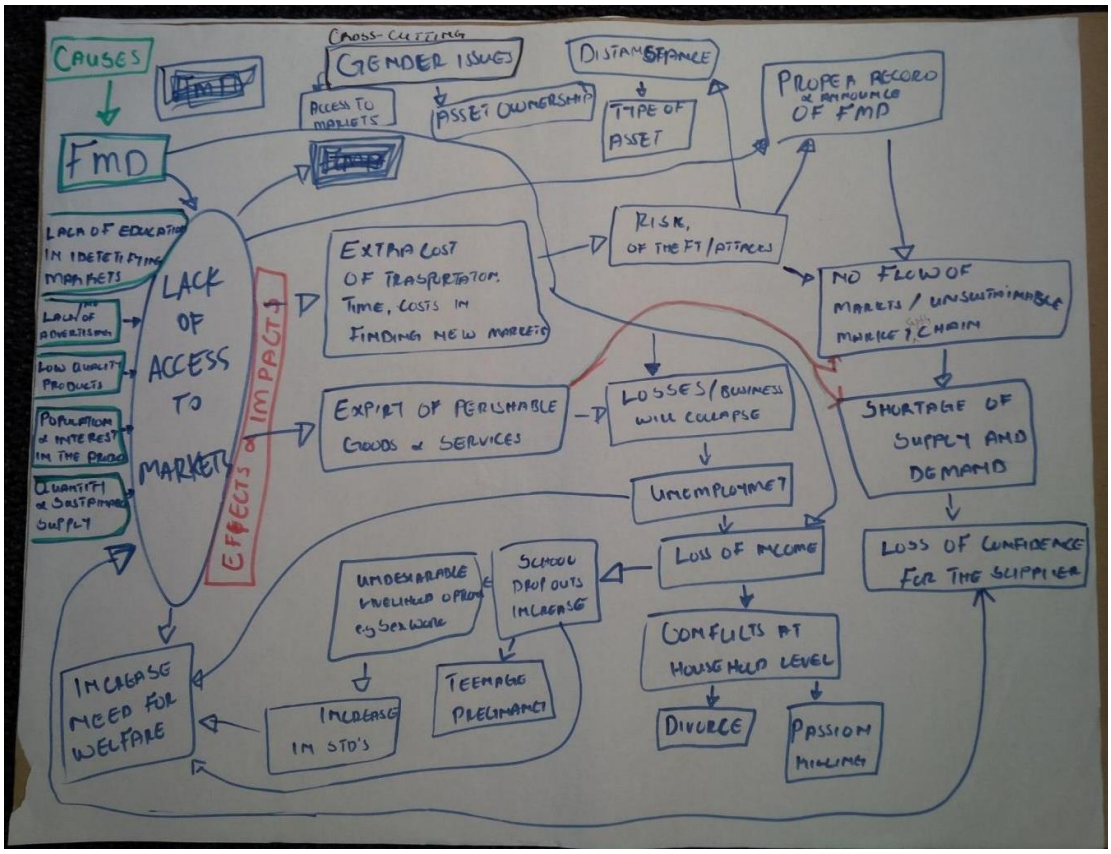

Figure 6. ICE for the lack of access to market (Group 3)

Overall, the impact chain of vulnerability to climate change affects men, women, youth and the elderly in different and intersecting ways. A further critical concern is that interim solutions such as *Ipelegeng*, a government "food-for-work" program, handouts and food baskets to vulnerable groups heightened the risk of dependency syndrome. This has a damaging potential for all affected and social and gendered groups to require or rely on welfare support which is beyond what Botswana can afford.

3.5 Adaptive Capacity Analysis

The 3rd stage of the VRA allows the KG to explore opportunities to address the vulnerabilities identified in steps 1 and 2 and build the resilience of the landscape under investigation by exploring the ideas developed thus far in the ICE step and turn some of the proposed solutions into fully-fledged adaptation responses.

Group 1: Drought and high temperature

1. Initiatives to improve crop production
    a) Advise people what type of crops to grow e.g. early maturing crops for faster yields or hybrid maize and sorghum
    b) Irrigate using underground water
    c) Share strategies on dealing with drought through education
    d) Plough better and use modern methods – through extension services
2. Improved pasture and livestock management practises
    a) Move livestock to healthier pastures (see note below)
    b) Destocking
    c) Supplementary feed
3. Promote sustainable harvesting of *Phane* worms
    a) Leave *phane* worms on the ground to allow them to reproduce for the next session/generation i.e. sustainable harvesting
    b) Enforce policy to control harvesting (no over-harvesting)
4. Options for improving water use efficiency
    a) Reduce, recycle, reuse
    b) Invest in water harvesting i.e. use of Jojo tanks that harvest water from rainfall which are currently used for backyard gardening.*
5. Approaches to deal with the impacts of drought on income
    a) Propose income generating activities instead of waiting for rain.
    b) Move away from dependency on government projects – 'when drought comes it bounces back to government' Mercy
    c) Strengthen existing government and private sectors projects e.g. women groups, Malema trust partnering with Tuli block – Shalley and Talama farms etc.

Group 2: Inadequate/lack of agricultural-based alternative livelihoods

The following measures were identified:

1. Youth initiatives by the government including technical skills development and employment opportunities linked to foreign investment (the KG commented that the government needed to support rural youth by encouraging investment for factories and business outside of towns/cities). The KG also thought they should provide support to the district businesses to curb migration
2. Exploration for mineral reserves
3. Irrigation through the Thune and Letsibogo dams
4. Controlled/regulated fish farming
5. Establishment of water packaging factory in the district

Group 3: Inadequate access to markets

The following measures were identified:

1. Skills development for making high quality products

2. Business management skills
3. Education and marketing skills training
4. Sensitisation welfare programs (e.g. sensitization on poverty eradication programmes to support people in dire conditions who cannot work)
5. Training on animal health and production
6. Market survey to gain a better understanding of opportunities and barriers for small scale farmers

Subsequently, the KG decided to focus on one single measure listed (per hazards/issue) and explore it further, aiming to incorporate it into community, municipality and/or district development plans. For this exercise, the facilitator suggested five principle guidelines to help inform the KG decision making[15];

1. Assets base: what will be needed in order to accomplish the expected output
2. Institutions: kind of support in order to do the work
3. Knowledge and information: kind of information available and necessary
4. Innovation: what new skills, technology, institution support and assets are necessary to facilitate the work
5. Flexible and forward looking decision making and governance: steps, institutions and assets to address future problems

Table 10. Priority Measure from group 1: Increasing awareness and uptake of drought management strategies

Assets base	● Farming equipments and new farming methods ● Improving land fertility and access to pasture ● Water infrastructure e.g. borehole ● Skills for craft making/business ● Social networks e.g. Letsema (network that supports agriculture), Mafisa (lending cattles for draft power and milk) and Majoko (system of working for others in exchange for agricultural produce)
Institutions	● Several institutions are already in place but the KG highlighted the need to decentralize them e.g. VDC, farmers' committees, DEP/DMT, Kgotla, BAMB, RIIC, Rural Training Centre (RTC), council and district administrators ● Continuous capacity building of the people in these institutions ● Review of mandate to align with current issues such as climate change
Information and knowledge	● Awareness programmes: TV, Kgotla ● Early Warning and Weather data system is needed e.g. for rain and temperature

[15] Adapted from ACCRA's Local Adaptive Capacity framework.
http://community.eldis.org/.59d669a7/ACCRA%20Local_Adaptive%20Policy_new.pdf

Flexible and forward looking	● Review strategies e.g. new technologies ● Formation of groups and associations

Table 11. Priority measure from group 3: Marketing skills and education

Asset base	● Equipment supplies e.g. computer and software ● Working capital to meet overall costs
Institutions	● Information and broadcasting department ● LEA, CEDA, MLG, MYSC, SPEDU ● Social and community development
Information and knowledge	● Media (facebook, twitter, whatsapp) ● Trainers (marketing, business development, life centres skills) ● Course package with relevant materials ● Keynote speakers
Innovations	● Computer packages ● Mentors/motivational speakers ● Launching of project
Flexible, forward looking	● Refresher courses as follow up ● Formation of interest groups for support.

A useful learning from completing this exercise was the need to obtain targeted data on the effects of hazards and adaptive responses by different social and gender groups. Lack of adequate disaggregated data remains a problem in understanding the different effects of the identified climate related problems. In particular gender disaggregated data for the chosen vulnerabilities and adaptive responses was identified as a critical requirement because the sources of data used in this paper suggest that men, youth, and women were affected differently by vulnerabilities and adaptive responses to climate risks and hazards.

To address this the facilitators decided that the ASSAR team in Botswana would actively use a gendered perspective when they worked on six additional villages as part of upgrading current work and generating findings that would align with existing opportunities to mitigate the impacts of climate change.

4. Aligning Findings with Opportunities

As the final step in the VRA process, the KG engaged in an open discussion to identify two key areas for further analysis and development. The discussion focused on what needs to be addressed and what actions need to be implemented in order to better respond to the priorities identified in the exercise. The areas identified were: 1) enhanced engagement of youth in adaptation responses and 2) increased participation of policy-makers and stakeholders, including community members, in identifying problems and proposing solutions together.

To help facilitate the involvement of young people and support their future resilience, education and sensitization are needed to help all parties engage with one another and for decision-makers to better understand what young people's aspirations are. For youth in and out of school several suggestions were made to carve the way forward; practical subjects aligned to employability must be taught alongside moral education and recreational facilities which would help prevent young people engage in destructive behaviour linked alcohol and substance abuse. The youth must also be encouraged to consider longer term solutions linked to resilient natural resources, ecosystems and viable livelihoods rather than "a get rich quick" mentality with no consideration for the future.

Engaging policy makers and achieving change through follow-up actions is vital to ensuring the VRA successfully supports the resilient development of the chosen socio-ecological landscape. To support this in Botswana the facilitation team explored ways of linking the VRA findings with other national processes. [16]

It is clear from conducting the VRA that much is known about the hazards and social issues being experienced at the community level as well as what adaptive strategies could be adopted. Furthermore, the KG and facilitators noted that Botswana does have trained experts in meteorological services, climatology, environmental science and other related fields who do research to inform practice and could help contribute to future scenario planning and adaptive action plans.

A major challenge that Botswana has experienced is that the in-country expertise and national policy is not well connected to global resources such as the climate change financing for

[16] Two key events that took place shortly after the VRA workshop are relevant to this discussion:

- In December 2015 a seminar on Botswana's Share of Climate Induced Hazards and Disasters was organized by the Botswana Global Environmental Change Committee at the University of Botswana in collaboration with the National Disaster Management Office (NDMO). This was a timely opportunity to deliberate on the challenges posed by climate driven hazards and disasters. The main conclusion from the event was the need to recognise that hazards only become disasters if preparedness, risk reduction and mitigation activities do not occur e.g. the drying up of the Gaborone dam was given as an example of when a potential disaster was known in advance and developed into a major threat due to the failure to act before the tipping point. The seminar also highlighted the need to ensure effective, inclusive dialogue with a variety of stakeholders to ensure policy makers are considering different needs when they develop adaptive strategies. The ASSAR team can have a role in moving this forward by engaging more actively with government and academic experts and encouraging transparent information sharing across different actors.
- At a global level Botswana was represented at the Paris COP21 which ensured the government is engaging in the global efforts to address climate change challenges through policy formulation, target setting and funding for large scale mitigation and adaptation initiatives.

developing countries and hence policies and ideas cannot be implemented at scale due to financial restrictions and resource scarcity. The group also acknowledged that the Government of Botswana does have social protection mechanisms to help protect and cushion citizens from the impacts of climate change however further investment is needed to ensure a robust nationwide roll-out. There also needs to be further communication of these funds so that all eligible citizens can claim the extra support when needed (the KG stated that at present it is usually the better off who get access to these services as they have access to the information). The poor remained without access to information on existing programmes probably due to a lack of empowerment in social, political, economic and cultural fronts.

4.1 The Gendered Experience of Vulnerability

As part of the multi-stakeholder consultations to gain a better understanding of the local perceptions of climate change and its causes, the gendered dynamic of exposure and sensitivity became increasingly prominent. As other research has shown, the VRA methodology demonstrated that social groups are differentially impacted upon by climate change. The VRA workshop looked at the gender dimensions of vulnerability in two ways: first by socially differentiating groups of women in the landscape; such as women traders, who were considered as a group; and by separately analysing their exposure and sensitivity. It became clear that even though different social groups are affected by climate change, women groups seem to be the most hard-hit. Second, the VRA promoted the participation of women and of representatives of women groups in the analysis, including of groups of women normally marginalised from spaces of dialogue (e.g. mopane worm harvesters, or elderly women with low incomes).

The disparities listed below suggest that women are highly vulnerable to the risks associated with climate change and have limited adaptive responses, while men are more likely to benefit from commercialization of water, crops, and livestock. There is a need for a gender study to provide gender-disaggregated data that can be used in programming for the strategic and practical needs of both men and women in Bobirwa.

4.2 Priority Hazards and Gendered Risks

Hazard or Issue	Gender- based Effects	Gender-based Adaptive Responses
1. Drought, low rainfall, high temperatures and ponds drying up	● Subsistence farmers, mainly women, are amongst the hardest hit. This is because drought cycles, low and sporadic rainfall and high temperatures seriously affect non- drought resistant low breed crops. ● Problems of water and food security, lack of yields form subsistence agriculture,	● Women resort to baking and selling bread, and going *phane* harvesting when it is available and in season.

	inadequate or non-existent water resources and poor human health hit women hardest. ● Commercial farmers are predominately men, they are better off in terms of returns on their yields and selling capacity. ● Men are expected to provide water for livestock in cases where they are heads of households. However due to the large number of female single heads of households, women still bear the burden of ensuring water availability, even with low income. ● Compared to men, women are responsible for securing water, food, fuel for daily cooking and heating in winter. Women also serve as caregivers at household and community volunteer levels.	
2. Inadequate and insufficient alternatives to agricultural based livelihoods	● Subsistence farmers' lack of alternatives to agriculture-based sources of livelihoods. Women are also dependent on natural resources such as veld products, basketry and firewood for livelihoods (petty traders). ● Women are well represented amongst the *phane* and grass harvesters. Their gendered activities are susceptible to the harsher impacts of climate change. ● Women who earn a livelihood by gathering and harvesting *phane* worms seasonally migrate to where *phane* worms are plentiful. There is also stiff competition from *phane* harvesters from Zimbabwe making it a less productive livelihood. ● Women, compared to men, have unequal access to resources and decision-making power, and limited mobility	● Women engage in petty trading (market trading) as hawkers, cooks and gatherers of *phane/ mokolwane* for basketry, and pick precious stones for sale and craftwork. ● Men have some deals in water harvesting from rainfall and use of *jojo* tanks to draw water from boreholes for sale to desperate households run by women with limited economic power. ● When recycling becomes advanced, men are more likely to be well represented in it than women because of their role in the public sphere. ● Men use drought resistant crops and modern methods of agriculture: Farmers also use advice they receive from the agricultural demonstrators on row

	because of household responsibilities. ● In comparison to men, women are the stewards of the household. They serve as managers of food, water, caregivers and support to the ill or elderly.	planting, use of pesticides, irrigation and use of hybrid seeds which can survive drought.
3. Difficult access to markets	● Craft makers and women traders lack markets to buy and sell their products e.g. *phane*, stone and *mokolwane* harvesters. They end up selling their goods locally at very low prices. ● Due to transportation constraints, women have to migrate to pick and sell stones in locations where buyers exist. Alternatively, they incur high transportation costs to move products to areas where sales occur but even then there is no reliable market. ● Women as caregivers at household level have to ensure availability of water for cooking, drinking and other household uses that do not count in official statistics as paid work.	● Men who own borehole access financially gain from the sale of water especially for commercialized farming.

4.3 Contribution to ASSAR

The VRA processes was hugely beneficial for the ASSAR team because it facilitated an in-depth joint exploration of key hazards and social issues with the KG participants and helped them to develop both a nuanced and collective understanding of the impacts (levels of exposure and sensitivity) on different socio-ecological groups. The VRA exercise promotes a multi-actor discussion and analysis of vulnerabilities and capacities, and by doing so fosters collaborative research. This differentiation is highly relevant not just for a proper understanding of the vulnerability of people who may be least visible (marginalised groups), but also for producing evidence to influence CCA (Climate Change Adaptation) policy and practice to address specific social groups and understand the implications of action and inaction on the full range of stakeholders. Furthermore, in relation to the research questions listed in the social differentiation in the concept note, the VRA has the potential to provide initial insights into all four questions and help evolve the team's understanding about differentiated impact.

Given the presence of ASSAR programme work in Botswana the team was able to draw some key lessons from this process which can help inform research agendas and programmatic ideas. The team should take note of the 'red flags' and 'safe spaces' for social groups in Bobirwa. Red flags refer to those hazards and issues which were categorised as having a considerable negative effect on the majority of social groups (i.e. drought, lower rainfall, high temperatures, and difficult access to markets), whilst safe spaces refer to those hazards and issues which, according to the VRA analysis, don't currently have a relevant negative impact on most social groups - nor are they expected to do so in the next 15 years (i.e. unequal access to water, limited access to and uptake of new agricultural practices and of meteorological data).

One interesting case is the issue of lack of alternatives to agriculture based livelihoods, for which social groups are either very vulnerable or not too vulnerable at all. These findings can provide a steer to regional and country teams in prioritising and de-prioritising areas of further research based on the expected impact that adaptation policies and responses would have on them. This is, likewise, directly relevant to the Research-into-Use (RiU) work as it pursues influencing the government and other stakeholders to act on issues that affect particularly vulnerable social groups.

4.4 Building an Understanding of Governance

A positive by-product of creating a KG and supporting dialogue between social groups and exchanges of information between communities and officials is that it can help support wider governance work. In this instance it helped to understand stakeholder relations and activities in the Bobirwa sub-district. Second, it helped strengthen governance arrangements in the district by supporting stakeholders' understanding of each other and of how they might work together in different ways in relation to reducing hazards.

The VRA process can also support staff and partners understanding of social power dynamics in a geographical area which can be beneficial for other programming activities. In this instance excellent facilitation helped prevent too much dominance from any one participant though on daytwo a new attendee, a retiree, who was very vocal and highly educated did dominate the conversations that he was involved in. It is very useful for the project staff to document these kinds of social undertones as helpful background information for future interventions in the area and with these social groups. For example, in the workshop participants highlighted that moving animals to other water sources during a drought was challenging due to the risk of theft. This example speaks to the governance of security in the region with theft being a problem and more widespread corruption linked to climate-induced stress. If security is improved, then moving cattle to cope with drought might become more feasible. This demonstrates that implementing some adaptive strategies requires governance and peace-building initiatives as well as climate related work. An important note here is that these subtexts can often be picked up better by local staff or translators as they may be too subtle for foreigners.

A second theme around drought governance is the role of government in supporting coping mechanisms and adaptive responses. Many participants held the view that it was the government's responsibility to implement support programs during a drought to the extent that one person said "there is no sense of trying to do alternatives at household level, as options are limited." Despite this prevailing attitude some of the young people were trying to actively seek their own solutions and promote the idea "don't be dependent on government if it's not working".

The VRA process can be a vehicle to breakdown some of these generalisations and through good governance mechanisms and a sense of shared responsibility encourage a more collaborative attitude to tackle the challenges posed by climate change. For example, a campaign for sufficient budget to enable government agriculture projects to buy enough sheet nets to cover plants when supporting small gardens so they are not so susceptible to heat stress, birds and other pests. Alongside this support can come from local citizens through 21 existing co-operatives and private sector business as a mall is planned for the area. The participants recognised these as alternative livelihood options and stressed the importance of having outside investors as part of the solution.

In relation to developing adaptive strategies it was mentioned that during a drought the Agriculture Department shares information on how to reduce the impact of drought by changing seed type, for example fast maturing plants including hybrid maize and sorghum. Unfortunately, it became apparent in the meeting that most small scale farmers are still using traditional ways of farming and some, still prefer the 'old' seeds which are passed on from generation to generation. Some even say that the 'old' seeds are tastier and better. The group was also unclear on how such messages where communicated to different groups. It therefore seems important to promote more research on understanding the low uptake of new agricultural approaches and technologies and particularly identifying ways the government can facilitate this at local level.

Finally, the VRA discussions naturally focused primarily on the impact of hazards on households and how households are managing these impacts but in reality of course many of these strategies are impacted by larger governance processes. This shows how vital it is to collaborate with district level governance structures when seeking adaptive solutions. Further areas to explore could include the governance of climate information such as; who produces it, how is it disseminated, how is it adapted, who are the actors it reaches and how do they use it?

Another focus could be around how government programmes target households during drought and the level of support that the district office has for managing these programmes e.g. one suggestion was to decentralise support organisations that provide markets training, such as the Botswana Marketing Board (BAMB) and Rural Training Center (RTC). Currently these organisations are not in Bobonong and the services they provide are not easily accessible. Overall one of the key strengths of the workshop was therefore how it enabled people to see the links between their activities and climate risk and responses and built this understanding between stakeholders - from the local level of farmers, traders and *phane* harvesters to the village level of village development committee member, farmers'

committee, women's groups to the district level of planners, economic planner and district social worker. When the Assistant Council Secretary for Bobirwa Sub-District, MMa Moepeng, closed the meeting she said:

> "I believe you will all go out from here as change agents and share with those who weren't able to spend time here. We all know this area is prone to disaster and diseases, but usually when we do our planning we consider issues like HIV and AIDS but rarely take into account issues of climate change. But this is the right time for us as we have just started our Chapter 8 District Development Plan and so will accommodate the issues that have been raised here. So [we] will come up with a plan that is suitable to the district."

4.5 Ecosystem Services

During the VRA workshop a number of critical ecosystem dependencies were identified; rainfall, vegetation (upon which *phane* caterpillars depend), wetland plants (*mokolwane* used in basketry), agriculture (crops and livestock), river sand, wood (for energy as fuel and for construction) and minerals. Through the planned VRAs in six other locations in the sub-district it is hoped that we will develop a more comprehensive understanding of how the social groups and livelihoods identified interact, rely and are impacted by the ecosystem e.g. help define issues of access and even ownership. This should lead to stakeholder identification of the key ecosystem services for different socio-economic groups across the entire sub-district and provide further information on the power dynamics at play with respect to the access and usage of key ecosystem services. The ASSAR Dynamics of Ecosystem Services (DES) research intends to use this information to consider the trends past, present and future in these key ecosystem services including the possible impacts of climate change. The DES research team will also look at how communities have adapted, or are adapting, to changes in availability of these key ecosystem services.

4.6 Knowledge System

The VRA represents a valuable opportunity to access three main forms of knowledge; scientific, local/indigenous and practitioner to help us understand how vulnerable people are impacted by and adapt to climate change. Due to the complex nature of climate change impacts and social group vulnerability it is critical to support processes like the VRA which through multi-stakeholder engagement facilitate an integration of all forms of knowledge. The VRA workshop therefore provided a first step in identifying how different knowledge forms interact and influence opinion and action in this context, as well as how important they are in achieving adaptation to climate change. For the ASSAR project these knowledge streams support their goal to understand forms of knowledge that enable effective, sustained and wide-spread adaptation.

4.7 Research into Use

The VRA has represented an important step in supporting Research-into-Use (RiU) work in Botswana because it allowed for a more detailed understanding of the social and governance

characteristics of the area where ASSAR works at the community and district levels. This knowledge will complement climate, environmental, and also social insights gained in the RDS to design and adapt research, stakeholder engagement and RiU strategies. The VRA exercise has also contributed to establishing and strengthening relations between stakeholders, and particularly across levels of governance, which is a crucial element for achieving equitable influencing of the CCA and development agendas at district and national levels.

One concrete action resulting from the VRA exercise is the opportunity for ASSAR to inform the development plan of the Bobirwa sub-district. As Pelaelo Master Tsayang, Principal Economist and District Planning Officer of the Bobirwa sub-district indicated: "This exercise will influence and contribute to draft our district development plan, particularly the activities related to climate change. Because of the useful outcomes the VRA generated, we will fund workshops like this in other parts of the district." The recognition by government officials of the value add of adopting an inclusive rights-based approach which promotes the representation of the most vulnerable and marginalised groups in decision-making on CCA is a very positive sign and opens the doors for promoting participatory CCA thinking and planning at national level, too (feeds into the broader objectives of ASSAR and CARIAA). From a more internal perspective, this exercise has helped ASSAR team members to value participatory and co-creative analyses mechanisms with stakeholders and helped them use the methodology to strengthen research processes and findings. Furthermore, the important value that 'vulnerable' and 'voiceless' stakeholders can provide in analytical discussions and, subsequently, in addressing research questions, has been recognised and reinforced.

5. Reflections and Conclusions

> The VRA "combines a participatory and analytical approach with creative elements in a way which inspires participants, builds a sense of agency and increases buy-in (...) in comparison for instance with key informant interviews."[17].

The Bobonong VRA exercise helped bring together a wide range of stakeholders around a common table to discuss, as equals, complex matters of relevance to people's daily lives as well as their implications on the longer term. A definite strength was the space it created for a diverse range of stakeholders in regard to their institutional, sectoral, social, economic, educational, gender and age interests to discuss ideas and experiences openly and freely. In particular this drew attention implicitly and sometimes explicitly - from household, local and district level perspectives - the underlying issues of gender, class, levels of education and sources of livelihood in relation to people's exposure and sensitivity to hazards. Whilst it is customary for people in Botswana to meet and discuss issues including those on development, the VRA offered a unique and more focused platform for detailed discussion and analysis therefore leading to, hopefully, an all-inclusive outcome. The VRA also represented an opportunity to foster collaboration between government actors at district and local levels, community members and civil society organisations which has the potential to lead to the design and implementation of sectoral and multi-sectoral measures and strategies. By taking an active role in identifying the issues at stake and by jointly analysing and designing adaptation responses for respective social groups, the exercise represented an opportunity to dialogue and start building trust among the KG members which included residents of the area (smallholder farmers, retirees, women working in handicraft trading), government agencies and government decision makers at different levels of governance. The VRA therefore helped each participant build a better understanding of the implications of hazards on different social groups and enabled them to take an initial step towards working together for laying the foundations for climate resilient development in the Sub District.

Starting trust building among stakeholders was also an important objective of the VRA. The overall constructiveness and openness of participants during the two-day workshop was promising and showed that it is worthwhile to dedicate efforts to promote participatory analytical exercises within ASSAR, and in general. We believe that mature, fair and constructive relations between stakeholder, as well as stakeholder participation, co-creation and ownership of adaptation and development planning processes, such as the VRA, are likely to improve the targeting and increase the effectiveness of adaptation measures and policies - and hence the research-into-use agenda of ASSAR in Botswana and Southern Africa. It is important for facilitation teams to recognise that this trust is fragile and must be nurtured; it requires following-up with feedback from previous work (e.g. VRA) and further opportunities for participatory activities that translate into action (e.g. local investments, policies, and changes in decision-making channels to make them more equitable). If supported in this way

[17] Morchain, D. & Kelsey, F. (January 2016) "Finding ways together to build resilience - The Vulnerability & Risk Assessment (VRA) methodology: principles, guide and lessons learned". Oxford: Oxfam GB.

it can galvanize local and national level activism and commitment to developing and implementing adaptive resilience-building strategies.

Another key strength was the time and effort put into planning for the VRA. Whilst there is always more to learn about the preparation for each VRA, and it is often context specific, in this instance sufficient consultation with relevant officers and authorities took place and a suitable venue was found. To ensure a productive and relevant VRA it is vital the Oxfam, as an organisation and staff, invest heavily especially in regard to time and expertise. Beyond the excellent outputs from the VRA workshop itself the process was also useful in terms of training the southern African team on how to conduct this type of assessment. This was further demonstrated by the local translators during the VRA workshop. It was their first time to do this kind of translation exercise but both acknowledged that they process equipped them with new skills and they felt empowered coming out of the event. Thus building capacity was another strong success of the workshop.

In addition to these reflections on the Bobonong exercise, the key strengths of the VRA as a participatory, cross-scalar process are summed below:

- The VRA employs a broad, gender-sensitive and flexible understanding of vulnerability
- The VRA interrogates the root causes of vulnerability and leads to improved contextual and systemic understanding
- The VRA uses a participatory approach that promotes dialogue, strengthens gender and stakeholder relations and builds capacity
- The VRA informs inclusive programme design and decision-making while building accountability[18]

The "acceptance" of the VRA outcomes by the Assistant District Commissioner and the Senior Assistant Council Secretary, arguably the two top civil servants in the sub-district is yet another significant positive outcome from this workshop and is a reflection of the valuable information collected during the workshop.

The document[19] describing the VRA methodology provides comprehensive instructions for undertaking VRAs but based on the learning from this workshop some further recommendations can be highlighted and taken as areas for improvement in future VRAs;

- It is vital to include all relevant stakeholders and pay special attention to including representatives from vulnerable and marginalised social groups in the KG otherwise you may miss critical information about how hazards or social issues affect groups differently. The role of the facilitators is also very important in ensuring the KG's discussions encourage dynamic, inclusive and meaningful dialogue. The VRA should be conducted in the spirit of collaboration and equality among participants to ensure no powerful actors overshadow or impose their views on other stakeholders.

[18] Morchain, D. & Kelsey, F. (January 2016) "Finding ways together to build resilience - The Vulnerability & Risk Assessment (VRA) methodology: principles, guide and lessons learned". Oxford: Oxfam GB.

[19] Morchain, D. & Kelsey, F. (January 2016) "Finding ways together to build resilience - The Vulnerability & Risk Assessment (VRA) methodology: principles, guide and lessons learned". Oxford: Oxfam GB.

- Accurately recording the information from the discussions is also important. Within this it is necessary to note opinions and commentary from each individual participant and attribute it to them, rather than representative of their organisation or the whole group e.g. a viewpoint held by a representative of the Ministry of Local Governments must be understood as this person's input and not the official position of the MLG.
- Practical issues should also be considered to ensure that the time of year, venue selection and setup help facilitate good participation and ensure all the relevant information can be gathered e.g. in this instance in Bobonong we conducted the VRA during a heat wave and with a delayed rainy season. Would the findings be different if we ran the VRA in the middle of winter? This is worth considering for the future and as part of planning for updating the VRA records.
- The facilitation Team (in this case ASSAR) should prepare a specific "feedback report" for the local authorities separate from the research report. Such feedback should be fashioned to help to inform the local authorities and to provide them with the specific recommendations from the VRA that the local authorities would consider in their planning and governance processes.
- To maintain an up-to-date and informed VRA document the lead agency/implementing partner should consider conducting renewal VRAs at intervals in the future. It is also worth exploring covering new socio-ecological landscapes as this will ensure a wider input of local knowledge about how climate change impacts on livelihoods and health of the communities and how adaptive measure can be sought. Thereby, increasing buy-in and stakeholders facilitating research. This activity also allows for stakeholder to come up with solutions that will work for them and to reflect on the potential impacts on them and other social groups of adaptation responses proposed by third parties. In Botswana ASSAR plans to conduct two more workshops in the first quarter of 2016 which will involve participants from six other villages in the sub-district. Whilst the ASSAR Botswana team will continue to lead this process they have secured the support of Sub-District Council and the office of the Assistant District Commissioner which is a fantastic result. One key action point for this next round of VRAs is a more careful targeted selection of the KG to ensure all relevant topics can be discussed whilst maintaining the possibility of comparison and generalisation of outcomes from across all the three VRAs.
- It is vital to plan feedback loops with stakeholders and to consider the different mediums to use to ensure all participants are able to access the information and provide further input e.g. some people were not conversant with English therefore some outputs would need to be translated. In addition, the youth group in Bobirwa informed us that they usually collaborate with government departments to communicate topics and issues to local communities using drama. They indicated that they would like to collaborate with ASSAR in the same way. This would be one quick and efficient way to communicate research outcomes with all stakeholders in a way that can be understood even by primary school children.

As we continue to develop the VRA model and build up a pool of piloted examples another area that needs attention are the challenges associated with following-up on suggestions and getting outcomes implemented. The energy and dynamism generated during the workshop in Bobonong needs to be transformed into action through relevant policy changes or actions on

the ground. The facilitation team needs to continue to support multi-stakeholder engagement in risk analysis and adaptive strategy planning. This can be done in multiple ways through campaigns on public participation, communicating community views to government officials via reports, seminars and events as well as supporting the continuation of stakeholder interactions by maintaining groups like the KG. This process needs to be carefully managed so as not to raise expectations of participants and to ensure full feedback loops e.g. the facilitation team must report back to the sub-district in regard to the VRA outcomes and continue engagement to support implementation of any commitments made by representatives at the VRA.

At the end of the workshop, the KG participants were asked to reflect on their experience of participating in the VRA. The discussions were highly rated by participants as an opportunity to personally and collectively dialogue on important aspects of climate change for actions that would promote best practices. From these quotations it seems the VRA was therefore successful in establishing an environment conducive to exchanging information and learning which lead to the development of a joint knowledge base about vulnerabilities, adaptive responses and survival mechanisms.

- "We now have a better sense of what areas the government is addressing here, and the gaps. I've learned about the priorities that the government has in this sub-district."
- "It was like a dream having the opportunity to sit around this group of so varied people. When they contacted me on the phone to invite me to this exercise I thought this wouldn't take us anywhere, but now I believe it will."
- "I used to think my ideas weren't worthwhile. Now I think I can make changes in my life and I know it is possible' from an elderly woman who makes baskets from palm tree leaves."
- "At the beginning of day 1 I didn't understand why *phane* worm harvesters were sitting around this table; now it is clear', and another one: 'Now I see that even our field assistants have something to contribute, so we have to listen to them".
- "People like to dwell on problems rather than focus on solutions. That's not what we did here. That's why I liked this workshop."
- "I've been thinking...the next time we should invite ourselves to each other's meetings rather than wait for people to come from far to do it."
- "I have learned I don't have to keep waiting for the government to do something, but rather more proactively involve myself in finding ways forward", from an out of school youth.
- "This was an opportunity for different views to come together. Everyone was free to express themselves on any issue they wanted."

6. Acknowledgments

The authors would like to thank the local and district authorities, as well as all other stakeholders involved in the VRA, for their invaluable contribution to this document. The team relied on communication support from two translators (Itireleng Masilo and Osenotse Kgadede). Jessica-Fullwood Thomas, Oxfam GB, and Laura Louw, ASSAR, contributed to editing the document.

7. Appendix

7.1 Appendix 1: Hazards & issues - Bobirwa, Nov. 2015[20]

	Hazard/ issue	Justification
1	Drought, lower rainfall, high temperatures and ponds drying up[21]	A common occurrence in Bobonong and a key issue affecting people's livelihoods and wellbeing.
2	Limited access and uptake of meteorological data	Relevant, timely and context specific information and advice from the meteorological service agency does not reach the farmers and communities in general.
3	Limited knowledge about climate change	There is general lack of awareness about climate change and the risks it poses to the communities and their wellbeing.
4	Foot and mouth disease (FMD) outbreaks	Most of Bobonong residents keep cattle. FMD outbreaks affect many farmers in the area. This is possibly partly caused by the migration of Buffalos from neighboring countries into Botswana.
5	Floods	Floods are not common in Bobonong, but they occur in the sub-district and affect the people of Bobirwa sub-district.
7	Limited uptake of new agriculture practices and farming technologies	There is very low uptake of new technologies and new approaches of farming by the small-scale farmers. New technologies of farming are introduced by central government and there seems to be no ownership by the local farmers.
8	Poorly resourced agricultural extension services	The agricultural extension officers have inadequate support-lacking transport, phones and internet. They are also extremely understaffed.
9	Political interference with sound and evidence-based planning	At times, politicians change plans such as planting approaches and land allocation.
10	High temperatures	
11	Cultural and religious beliefs stopping new practices	There is a strong culture of praying for rain in the sub-district
12	Livestock theft	It is not unusual that Bobirwa farmers' livestock are stolen and, possibly, taken across the border to Zimbabwe
13	Unequal and unfair access to water at sub-district level	Bobirwa residents claim that they have no access to Limpopo River water yet South Africans use this water
14	Sand mining	
15	Difficult access to markets & lack of alternatives to agricultural based livelihoods	Insufficient access to institutions that facilitate and promote trade for small scale producers is prevalent in the sub-district. At the same time, climatic impacts put additional stress on the majority of the population, who cannot find alternative employment options to farming; e.g. in services or industry

[20] Five hazards i.e. Floods, Unequal and unfair access to water at sub-district level, Sand mining, Livestock theft and Cultural and religious beliefs stopping new practises were taken out

[21] High temperatures was incorporated into this issue

7.2 Appendix 2: Social groups & Livelihood activities

	Social groups & Livelihood activities	Justification
1	SS subsistence crop farmers	Majority of the local community are involved in small scale subsistence crop farming. This includes both men and women.
2	SS livestock keeper	Keeping cattle is not only a key livelihood strategy but also cultural practice for the people of Bobonong.
3	Phane harvesters (mainly women)	Large number of phane worm harvesters in Bobirwa; this being of high importance in regards to income generation.
4	Women traders of vegetable produce	This group is significantly limited in their actions at the moment due to difficult access to markets, but offers potential for becoming a more relevant livelihood activity
5	Women handicraft (basketry)	Relevant income generating activity for women; at the same time being an alternative to agricultural based livelihood
6	Out of school youth (18-35 years old)	Very important group finding few options for making a living in the sub-district and retorting, in cases, to antisocial behaviour, such as intra-household violence (violence against women and violence against parents cases described), as well as creating urban migration problems both in cities and in the sub-district. It should be noted that success stories of migration also exist; and also that this group offers an educated workforce supply for potential non-farming livelihoods in the sub-district.
7	Retirees	Educated group, retired around 45, relatively wealthy, have a voice, generally well respected in the community
8	Commercial farmers	Irrigated land; livestock and horticultural
9	Elderly	The elderly make up a considerable percentage of the local community
10	People depending on welfare programmes and remittances.	High numbers in the sub-district.

7.3 Appendix 3: VRA knowledge group participants

Day One: 11th November 2015

Gender	Name	Occupation	Contacts
Male	Osenotse Kgadedi	Facilitator	74605596
Male	Thapelo Rasetshwane	Poverty Eradication Crops	71241208
Female	Johannah Mangolo	Self Employed (market trader)	76167677
Female	Mercy Mashaba	Farmer	76672519
Female	Glady Mashaba	Self employed	77107368
Female	Kelebogile Motsamai	Bobonong Home-based care volunteer	72592983
Female	Basuti Jacobs	Bobonong home-based care Coordinator	71453503
Female	Constance .S. Konyana	Ministers Fraternal (church)	71587606
Male	Peter Mavona	Farmers Association	75412888
Female	Georginah Bonang	Crop production extension officer	740095115
Male	Gabobofane Mbwe	Bobirwa sub council Social & community development	71779777
Female	Mercy Malebogo Ketlhoilwe	Bobirwa sub council Environmental Health Department	73310080
Male	Letsweletse Mponang	U/N	76791774
Female	Sarinah Mothelo	Farmer	77128718
Male	Boitumelo Kgosietsile	VDC chairman (Umbrella chairperson)	76668788
Female	Itireleng Masilo	Unemployed youth/ translator	74695186/ 74464136
Female	Jane I Chuma	Programmes officer (Youth)	74132343
Female	Gabantirele Petros	Basketry	

Female	Lesele Motheo	Basketry	75421660
Female	Selinah Jackson	Pot Making	71533582
Female	Leah Moiteelasilo	Adult teacher	76118134
Female	Fenny Mapharing	Wildlife officer	73068826

Day Two: 12th November 2015

Gender	Name	Occupation	Contacts
Male	Pelaelo Tsayang	Economist/ Sub-District planner	71826839
Female	Godiramang Tshenkego	Small trader	75542611
Female	Gladys Mashaba	Small trader	77107368
Male	Thapelo Rasetshwane	Poverty eradication (crops)	71241208
Female	Johannah Mangolo	Small trader	75554717
Female	Mercy M. Ketlhoilwe	Environmental Health officer	73310080
Female	Gabantirele Petros	Basketry	74368608
Female	Leah Moiteelasilo	Adult Education	76118134
Female	Georginah Bonang	Crop production	744009545
Male	Peter Mavona	Farmers association	75412888
Male	Boitumelo Kgosietsile	Umbrella Chairperson (VDC chairman)	76668788
Female	Basuti Jacobs	Home based care coordinator	2619741/ 71453503
Female	Mercy Mashaba	Farmer	76672599/ 71709363
Male	Sediba Robert	Pensioner – Retiree	72358089
Male	Peter M Sekgwama	Pensioner – Retiree	71606564/ 73805044
Female	Jane I Chuma	Programmes officer	74132434
Female	Itireleng Masilo	Unemployed Youth _ workshop translator	74464136/ 74695186

Male	Gabobofane Mbwe	Social & community development officer	71779777
Female	Kelebogile Motsamai	Home based care volunteer	72592983
Female	Sarinah Mothelo	Farmer	77128718
Male	Letsweletse Mponang	Unemployed – workshop translator	76791774