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1. INTRODUCTION

As part of the pilot phase of the IUCN Climate Change and Development Project, funded by the Ministry of Foreign Affairs of Finland, a climate change vulnerability assessment was undertaken in four ongoing field project sites in Zambia. The purpose of this vulnerability assessment was three-fold:

1. To get **indication of the risks related to climate change at the local level for the full-size project proposal**

Figure 1: Agroecological Zones of Zambia and Field Project Sites



Climate change local-level vulnerability assessments were accomplished using Community-Based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL). CRiSTAL is a decision support tool developed jointly by IUCN, IISD, SEI-B and Intercooperation that is intended to enable project planners and managers to assess and enhance a project’s impact on community-level adaptive capacity. This tool includes two modules, four main questions, and a series of subquestions:

Module 1: Synthesizing information on climate and livelihoods

Question 1: What is the climate context?

- 1.1. What are the main climate hazards?
- 1.2. What are the main impacts of those hazards
- 1.3. What are the communities’ strategies to cope with these impacts?

Question 2: What is the livelihood context?

- 2.1. What are the main livelihood resources?
- 2.2. How are those resources influenced by climate hazards?

2. BACKGROUND ON CLIMATE CHANGE VULNERABILITY AND ADAPTIVE CAPACITY

Vulnerability to climate change is "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes." Vulnerability is a function of:

- The magnitude, character and rate of climate change
- The sensitivity of the system, i.e. the degree to which the system is adversely or beneficially affected by climate-related stimuli
- The adaptive capacity of the system, i.e. the system's ability to adjust to climate change, to moderate or cope with the impacts, and to take advantages of the opportunities (IPCC, 2001).

Some regions of the world are considered more vulnerable than others to climate change. Most less-developed countries, including Zambia, are highly vulnerable because a large part of their economy is dependent on climate-sensitive sectors like agriculture and local natural resources, and their adaptive capacity is often limited by inadequate human, financial and natural resources, and by low institutional and technological capability (IPCC, 2001).

Africa is considered to be among the most vulnerable regions of the world to climate change. According to the IPCC predictions (IPCC, 2007):

- By 2020, 75-250 million people in Africa will be exposed to increased water stress due to climate change
- Agricultural production, including access to food, is projected to be severely compromised by climate variability and change
- There is an expected decrease in area suitable for agriculture, length of growing seasons and yield potential, particularly along margins of semi-arid and arid areas
-

3. CONSULTATION RESULTS

3.1. CIFOR Site, Mufulira District, Copperbelt Province¹

Mufulira District is located in the agroecological zone III. The main activities undertaken by communities in this district are:

1. Beekeeping: There is a beekeeping association. It is done by both men and women (the Chairperson is a woman)

can we survive when facing floods and droughts?” and are saying “We need to find other means of survival [than agriculture]”.

The 3 main climate hazards affecting participants’ livelihoods are: floods, droughts, and high temperatures. The climate hazards’ main impacts and the community’s coping strategies are presented in the table below.

harvests will be reduced and delayed. However, this means that honey prices will go up, which pleases honey producers.

The participants' income generating activities are: charcoal burning, beekeeping, agricultural production (the women sell maize, cassava and sweet potatoes beside the main road, and some cassava is sent to Lusa

interested in planting trees, but there is a lack of funds and the government is not providing seeds or seedlings anymore, so they would need to buy some.

The main three climate hazards affecting the participants' livelihoods are: drought, floods, and late coming of the rains (shorter rainy season). Climate hazards' impacts and charcoal burners' main coping strategies are presented in the table below.

Table 3: Climate Context (Charcoal Burners, Mufulira District)

Hazard	Impact	Coping Strategy
Water shortage	Dig deeper wells for domestic water	Buy water
Operational businesses	Drought	Reduce charcoal prod'n & business (hard ground)
Damage to dwellings	Rent houses from neighbours	Build charcoal kilns near ant hills (where earth is softer)
Crop damage/loss	Crop damage/loss	Reduce charcoal prod'n & business (hard ground)
Wild food gathering	Wild food gathering	Wild food gathering
Shorter rainy season	Shorter rainy season	Shorter rainy season

Drought leads to more competition for charcoal making and therefore less business. Late coming of the rains also affects charcoal burning business negatively, as competition increases, the ground becomes harder and production is more difficult. Floods, on the opposite, lead to a competitive advantage for specialized, experienced charcoal burners, as they are the only ones who can manage to make charcoal in flood conditions. Also demand usually increases in times of floods.

Crop production is negatively affected by the three main climate hazards, and charcoal burners cope by: food rationing, doing casual labor (mainly agricultural work), selling more charcoal, borrowing money for food, and wild fruit harvesting. Late coming of the rains does not allow crops to reach maturity, and charcoal burners lack money to buy early maturing seeds.

3.1.4. Consultation with CIFOR and IUCN staff

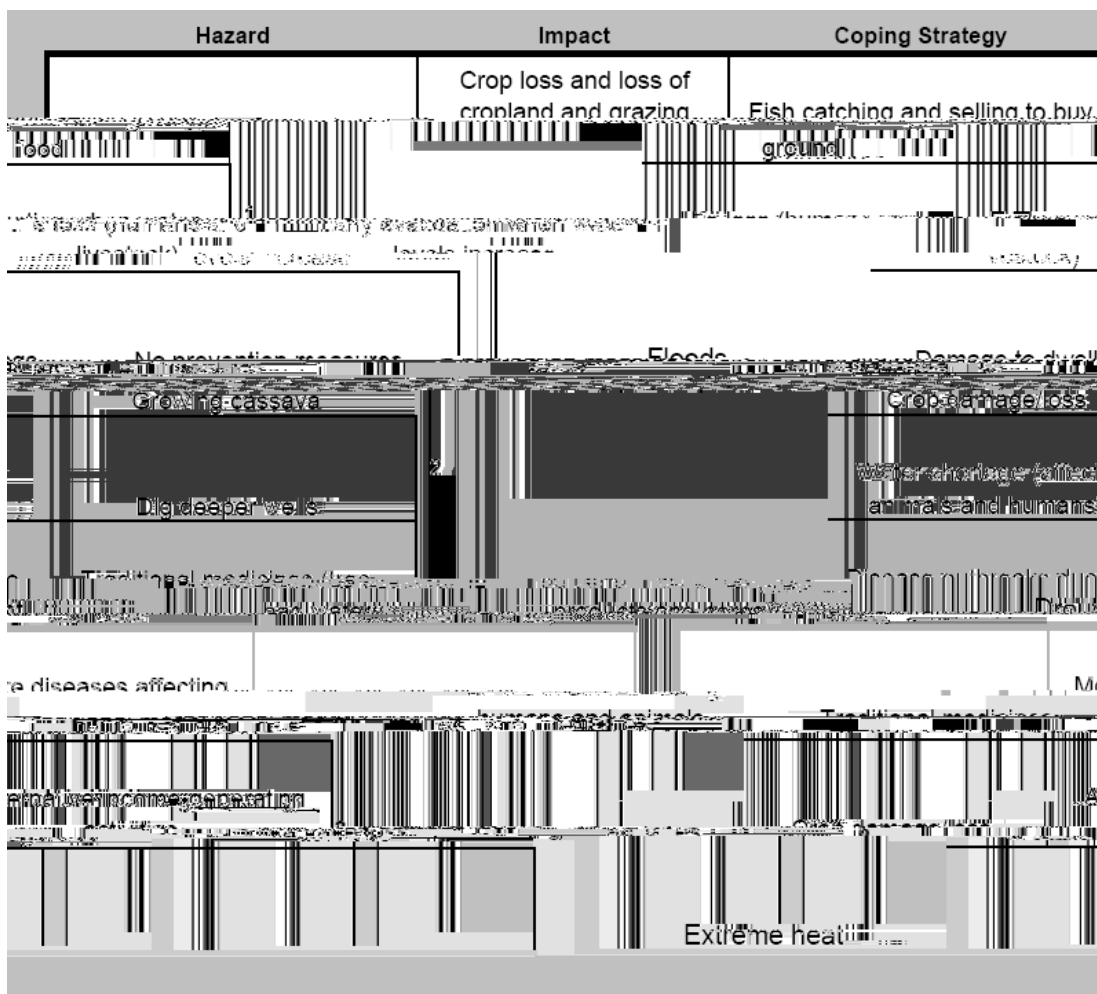
The IUCN Climate Change and Development Project and the CRiSTAL tool were presented to Manyewu Mutamba (CIFOR) and Excellent Hachileka (IUCN). A short training on CRiSTAL was provided, and we went through the CRiSTAL process using data collected during the community consultations in Mufulira District.

The CIFOR project in that district is mainly

these farmers the next morning. We therefore organized a consultation with farmers living in a more accessible village not far from the project site. Even though these farmers were not directly involved in the IUCN ZBWP, their livelihoods and climate context were similar to those of the contact farmers involved in the ZBWP.

The village and area where the consultation

Table 4: Climate Context (Samunyingi Village, Lukulu District)



The influence of those climate hazards on the community's main livelihood resources was also discussed with the community members. The table below presents the main livelihood resources in the left column, and the level of influence of the main three hazards. Influences (above the 0 level) are all negative, except in the case of floods' influence on fish and fishing capacity, and extreme heat's influence on bricklaying, which were considered positive.

Table 5: Livelihood Context (Samunyingi Village, Lukulu District)

(= full influence): context (0 = no influence, 5 = full influence)

Resource Category	Sub-category	1	2	3	4	5
Natural Resources	1 Fish	X				
	2 Forest					
	3 Agricultural lands					
	4 Pasture					
Physical Resources	1 School					
	2 Roads					
Financial Resources	Liquid assets: crops (maize), livestock					
	2 High season (July-Sept)					
	3 Low season (Jan-Mar)					
Human Resources	1 Farming capability					
	2 Fishing capability					
	Craft-making and brick-laying					
Social Resources	1 Church					
	2 Working cooperative (but it is not working anymore)	X				
	3 Other	X				

3.2.2. Consultation with the IUCN ZBWP Phase II Field Project Officer

The last section of CRiSTAL module 1 (the importance of livelihood resources for coping with climate hazards) and module 2 were completed with Simbotwe Mwiga, the Field Project Officer for the ZBWP Phase II.

The screened project activities were:

1. Training of contact farmers in agricultural extension (land preparation, planting, weeding, use of chemical fertilizers and manure)
2. Distribution of farming inputs (NPK fertilizers, seeds, cash for labor costs)
3. Monitoring of crop development by the IUCN project team
4. Training of contact farmers on harvesting techniques and crop storage and marketing

amongst them, as others argued that some areas have a lot of trees but experience changes in climate as well. We therefore explained to participants the basics of climate change (causes, impacts, predictions, and the importance of mitigation and adaptation).

The main climate hazards experienced by participants, the impacts of those hazards, and the main coping strategies are presented in the table below:

Table 6: Climate Context (Valley System, Lukwesa Village)

Fish stocks are also affected by drought and extreme heat. The main coping strategy is income diversification, mostly agricultural production. However, as mentioned above, agriculture is also negatively affected by climate hazards.

The increase in diseases (affecting livestock, humans and crops) is an important impact of extreme heat events and floods, mainly due to reduced water quality and increased waterborne diseases and mosquito breeding.

Floods have a negative short-term impact on fish catches, as fish have more potential breeding areas. However, the long-term impact on fish resources is positive. Floods may lead to either soil fertilization or increased arable soil erosion. Floods also decrease arable land area and negatively affect water quality. Trading is decreased during the flooding period, since less liquid assets are produced and roads become impassable. However, after the flooding period, fish catches and fish trading might be improved due to flood-induced increase in fish breeding.

Extreme heat and droughts have negative impacts on fish body formation and reproduction. These hazards also reduce microbial activity in arable soils, increase termite activity (leading to crop damage), decrease water levels, and reduce water quality.

Alternative financial resources (charcoal burning, blacksmithing and carpentry products) are also negatively affected by the three climate hazards, as fewer raw materials are available, and human capability to make these products is negatively affected.

The three climate hazards reduce human capability and productivity, due to the hazards' impacts on crop yields (and consequent hunger and malnutrition) and human diseases. The three hazards also lead to less social activities, as members of the Business Associations, Women's Club, and Multi-purpose Cooperative meet less often when there are no products (e.g. fish, crops) to sell.

3.3.2. Community Consultation – Plateau System, Chimfula Village, Mansa District

The plateau system in Mansa District is mainly composed of Miombo woodland species. Communities in Mansa District are closer to the big Mansa markets than communities in Mwense District, so they transport and sell more agricultural products (mostly crops and small livestock), charcoal, and firewood. Along the road between Chimfula Village and Mansa, villagers are transporting bags of sweet potatoes, cabbage, and charcoal on their bicycles, and piles of firewood are waiting to be picked up. There are fewer settlements in the plateau system than in the valley system, as agriculturalists usually live more dispersed than fishermen.

The main livelihood activities of community members in Chimfula Village are: 1) agriculture (mixed farming: crops and small livestock); 2) Charcoal production (mostly done illegally in this region, since it would not be profitable with the added cost of a license); 3) Small-scale fishing and beekeeping, mostly for household consumption.

Community members mentioned having perceived a gradual increase in temperatures, an increase in drought frequency and severity, and a decrease in the length of the rainy season, during the past 3 to 6 years. The increase in temperature is most apparent during the cold season. Villagers have also noticed an increase in rain intensity, though this has not induced any significant damage. Villagers emphasized that the biggest problem is drought.

Participants in the consultation had heard about changes in climate in other regions of the province and in other countries (e.g. Zimbabwe and Malawi). Participants debated amongst themselves regarding the causes/drivers of those changes. Some argued that it is impossible to know the causes, as it only depends on God. Others argued that rainfall patterns are affected by deforestation of large areas. No participant had heard of fossil fuel burning and its effects on climate. We therefore presented to participants some background information on climate change.

The main climate hazards experienced by community members, the impacts of those hazards, and the current coping strategies are presented in the table below.

Table 8: Climate Context (Plateau System, Chimfula Village)

Hazard	Impact	Coping Strategy
Decreased rainfall	Crop loss and hunger	Earlier planting
Increased temperature	Decreased soil fertility	Use of manure
Increased temperature	Increased diseases and health problems	Use of medicinal plants
Increased temperature	Distribution and abundance of mesquite	Use of mesquite for fuel
Increased temperature	High temperatures	Use of shade trees
Increased temperature	Decreased crop yields leading to hunger	Use of drought-tolerant crops (e.g. cassava)
Increased temperature	Decreased income from crop sales	Use of cash crops (e.g. groundnuts)
Increased temperature	Buying seeds for next growing season	Use of local seed banks
Increased temperature	Buying seeds for next growing season	Use of local seed banks
Increased temperature	Buying seeds for next growing season	Use of local seed banks

An important impact of the three main climate hazards is crop loss, leading to hunger and decreased income. Coping strategies to deal with crop loss include: earlier crop planting, using more drought-tolerant crops (e.g. cassava); keeping more crops for household

consumption (selling less to prevent hunger); improve crop storage; irrigation (practiced by very few); and finding alternative income sources (mainly charcoal burning and selling grass and livestock).

Participants mentioned a decrease in soil fertility (due to decreased microbial activity) and an increase in soil erosion in times of droughts. Coping strategies involve: avoiding late burning of grass; incorporation of crop residues; crop rotations; intercropping (e.g. groundnuts and cassava); cover cropping (using beans, groundnuts, cowpeas or sweet potatoes) and contour bands.

The community's main livelihood resources and the climate hazards' influences on those resources are presented in the table below.

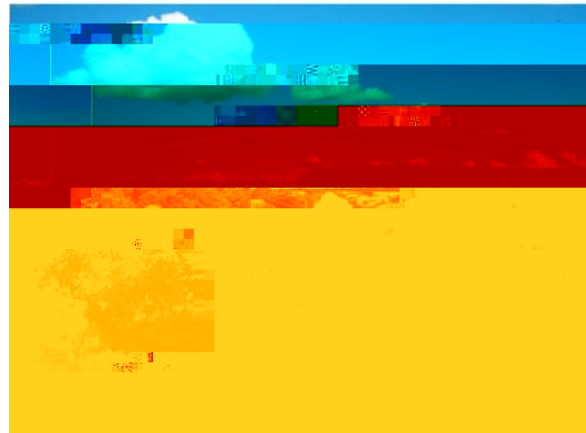
Table 9: Livelihood Context (Plateau System, Chimfula Village)

Forests and trees are considered important resources, as they provide soil nutrients (for sash and burn agriculture), tr

Due to droughts, there has been a shift in cultivation from highlands to lower lands. Cassava yields are affected by drought, but cassava is more drought-tolerant than the other crops. People are resistant to increase cassava cultivation to cope with droughts, because high rain intensity during the rainy season negatively affects post-harvest drying of cassava.

Due to this year's floods, people have been forced to move back to the uplands. Increased rain intensity is leading to reduced crop yields, crop damage/loss (villagers cannot dry their cassava crops anymore, and the cassava planting material gets damaged), food scarcity, and soil nutrient leaching. Cassava drying in times of high rains is a big issue, and community members are asking for assistance to find technological or managerial solutions to this increasing problem.

Fishing is also negatively affected by droughts and high rain intensity. The villagers' main coping strategy is income diversification (e.g. engage in agricultural production, craft making, and grass selling). However, these alternative income-generating activities are also negatively affected by climate hazards. Changing fishing gear to catch smaller fish, and selling less fish (keeping most of it for household consumption) were other coping strategies mentioned.



3.3.4. Consultation with Government Officials in Mansa

A presentation was done by Beatrice Riche (IUCN) to government officials from the Agriculture, Fisheries, and Meteorology Departments in Mansa District, regarding:

- 1) Climate change: scientific basis, impacts, vulnerability, and adaptation
- 2) IUCN Climate Change and Development Project
- 3) Community-Based Risk Screening Tool - Adaptation and Livelihoods (CRiSTAL)

This was followed by a period of questions and discussion on climate change impacts, mitigation and adaptation.

3.3.5. Consultation with PLARD team in Mansa

Results from the three community consultations in Southern Province were presented to PLARD staff in Mansa. This led to interesting discussions on the communities' livelihoods, the impacts of climate hazards, and communities' current coping strategies.

This was followed by training of project staff on the use of CRiSTAL. As part of this training, we completed together Module 1 for the Plateau System and Module 2 for the Lake System.

The project activities analyzed in Module 2 were:

- 1) Setting up fish processing facilities
- 2) Promote productivity of cassava
- 3) Formation of farm forum groups

changes in weather patterns in the last few years, and mostly during the last year. The main climate hazards, impacts and coping strategies are presented in the table below.

Table 11: Climate Context (Dambwa Local Forest, Livingstone District)

Hazard	Impact	Coping Strategy
	Crop damage/loss	Income diversification (mostly charcoal prod)
		Use of traditional/herbal medicines
Sinking boreholes	Drought	Water shortages
	Increase in diseases	repellents
	Decreased human capacity	
Extreme heat	Loss of life (animals)	Buying medicines for cattle

Droughts have destroyed almost all of their crops this year. Income diversification to deal with drought-induced crop damage includes: charcoal production (#1 coping strategy), timber, honey and beer production, and selling livestock. Additional coping strategies involve: harvesting wild fruits, and getting support from NGOs and the government. Villagers are already growing the most drought-tolerant crop species available (cassava, millet and sorghum), so switching to more drought tolerant crops is not really possible.

During the consultation, we also identified the main livelihood resources and the impacts of climate hazards on these resources. Results are summarized in the table below.

Table 12: Livelihood Context (Dambwa Local Forest, Livingstone District)

3.4.2. Consultation with PFAP team (Forestr

4. SUMMARY AND ANALYSIS OF RESULTS

4.1. Climate Hazards, Impacts, and Coping Strategies

Four climate hazards were identified as having a major influence on people's livelihoods:

- Drought was considered the #1 climate hazard by 5 of the 7 communities. It was mentioned as one of the main three climate hazards by **all** of the 7 communities.
- Floods (or an increase in rain intensity) were considered the #1 climate hazard by 2 of the 7 communities (in Western Province and in Luapula Province valley system; two lowland areas). It was mentioned as one of the main three climate hazards by 5 communities. Only communities in Southern Province (agroecological zone I) and in Luapula Province plateau system (located in the higher lands) did not mention floods as an important climate hazard.
- Extreme heat was considered as the second most important climate hazard in 4 of the 7 communities. It was mentioned as one of the main three climate hazards by 6 communities.
- A shorter rainy season was considered one of the main three climate hazards by 2 of the communities. It was mentioned as an important observed change in weather patterns by all communities except in Western Province.

Variability is a feature of the Zambian climate, which has a history of droughts and floods. However, all communities mentioned an increase in droughts, rain intensity, and extreme heat events. They evaluated the start of changes to 3 to 9 years ago. These changes are in accordance with the IPCC climate change observations and predictions (IPCC, 2007) for the 20th and 21st centuries, i.e. increased frequency of warm spells and heat waves over most land area; warmer and more frequent hot days and nights; increased frequency of heavy precipitation events, and increased area affected by drought.

The impacts of these climate hazards on people's livelihoods, in the 7 communities met, are summarized in the table below.

Table 13: Main Impacts of Climate Hazards

Drought	Floods	Extreme Heat	Shorter Rainy Season
<ul style="list-style-type: none">• Crop damage/loss, leading to food scarcity and hunger• Water shortages• Reduced fish stocks• Income loss• Reduced charcoal business•			

Table 14: Main Coping Strategies

Drought	Floods	Extreme Heat	Shorter Rainy Season
<ul style="list-style-type: none"> • Income diversification (charcoal making, fishing, honey and beer production, selling grass and livestock, casual labor) to buy food • Trading other commodities for food • Gathering and selling wild food • Food rationing • Selling less crops to keep more for household consumption • Shifting agricultural production from highlands to lower lands • Earlier crop planting • Growing more drought resistant crops (e.g. cassava) • Incorporation of crop residues instead of burning • Crop rotations, intercropping, and cover cropping • Irrigation (practiced by very few) • Sinking wells • Walking longer distances to get water • Using medicinal plants to treat diseases • Going to the medical clinic • Boiling water or treating it with chlorine • Getting support from NGOs and the government 	<ul style="list-style-type: none"> • Income diversification (charcoal, crafts, mats and beer making, fishing, grass selling, casual labor) to buy food • Trading other commodities for food • Gathering and selling wild food • Shifting agricultural production, livestock and houses to higher lands • Using medicinal plants to treat diseases • Boiling water or treating it with chlorine to prevent diseases • Bury ditches to prevent waterborne diseases • Early evacuation when water levels increase • Improve drainage around houses • Putting plastic on top of houses • If houses are destroyed, build temporary shelters or live temporarily with neighbors 	<ul style="list-style-type: none"> • Using medicinal plants to treat diseases • Boiling water or treating it with chlorine to prevent diseases • Going to the medical clinic • Buying and using mosquito nets and repellents • Working earlier in the morning • Buying medicines for cattle • Income diversification (e.g. agricultural production to cope with decreased fish stocks; charcoal production to cope with crop loss) • Trading other commodities for food • Earlier crop planting • Taking animals out early in the morning • Using zero-grazing for some animals 	<ul style="list-style-type: none"> • Income diversification (selling charcoal, livestock or grass; casual labor) • Selling less crops to keep more for household consumption • Gathering wild food • Buying seeds for the next growing season • Exchanging house06(g ze)8.35[(SellID-0.000

medical clinics are often far away from the village and traditional medicines are not considered by villagers as being very effective.

Coping strategies to deal with crop loss and decreasing fish stocks are also very similar between the different villages. Communities cope mainly by diversifying their sources of income and relying more heavily on alternative natural resources from forests and wetlands. However, there are major differences in income diversification possibilities. Some communities have access to more natural resources (wild foods, non-timber forest products, fish, etc.) or have a higher level of specialization, education, expertise, coordination, or institutional support (e.g. specialized charcoal makers in the Copperbelt Province) than other communities, which enhances their adaptive capacity. In addition, there are major differences in the extent of agricultural knowledge and coping strategies associated to crop management (use of crop rotations, intercropping, cover crops, etc.).

4.2. Links between Livelihoods and Climate Change Vulnerability and Adaptation

The following table summarizes the livelihood resources most affected by climate hazards in the different Zambian communities.

Table 15: Livelihood Resources Most Affected by Climate Hazards

	Copperbelt Province, Beekeepers	Copperbelt Province, Charcoal Burners	Western Province	Luapula Province, Valley System	Luapula Province, Plateau System	Luapula Province, Lake System	Southern Province
Natural Resources	Bees Mushrooms	Land Grass	Fish Livestock Fertile agricultural land	Fish Arable land Water	Arable land Water Forest/Trees	Fish Water	Forest products Water
Physical Resources	Roads	Roads Storage sheds for charcoal	School Roads	Roads			
Financial Resources	Liquid assets: crops, livestock, charcoal, honey	Liquid assets: crops, livestock	Liquid assets: crops (maize), livestock (chicken, cattle), fish	Liquid assets: fish, crops, charcoal, and blacksmithing and carpentry products	Liquid assets: agricultural products and charcoal	Fish selling Crop selling Casual labor	Liquid assets: cash crops and livestock
Human Resources	Charcoal burning capability Agricultural work capability	Farming capability	Farming capability Fishing capability	Fishing capability Farming capability			

Social Resources							
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The climate hazard impacts on the livelihood resources listed above are all negative, except for a few exceptions:

1. Bees and honey: Drought (if not too extended or severe) triggers plant flowering and therefore has a positive effect on bees and honey production. However, if the drought is too prolonged, bees may die or migrate.
2. Mushrooms: They are positively affected by floods, but negatively affected by droughts.
3. Charcoal production: Floods have a negative impact on charcoal production for unspecialized producers, but have a positive impact for more experienced, organized and specialized producers (e.g. members of the Mufulira Charcoal Burners' Association), who have a competitive advantage when conditions are more difficult. Also, charcoal demand usually increases in times of floods.

The 7 communities are all greatly dependent on climate-sensitive resources (e.g. water, arable land, fish, and forest products). In addition, climate hazards' impacts on those resources are being amplified by other local factors, like inappropriate natural resource management (overfishing, deforestation, reduced agricultural fallow time, etc.).

The livelihood resources most important to cope with climate hazards in the different communities are summarized in the table below.

Table 16: Livelihood Resources Most Important for Coping with Climate Hazards

	Copperbelt Province, Beekeepers	Copperbelt Province, Charcoal Burners	Western Province	Luapula Province, Valley System	Luapula Province, Plateau System	Luapula Province, Plateau System	Southern Province
Natural Resources	Trees Bees Mushrooms	Trees Land Grass	Fish Livestock Fertile agricultural land	Fish Arable land Water	Arable land Water Forest/Trees	Fish Water Arable land	Arable land Forest products Water
Physical Resources	Roads Bicycles Agricultural implements		Roads	Fishing implements Agricultural implements Bicycles and roads	Agricultural implements Bicycles	Agricultural implements Bicycles	Agricultural implements Roads and bridges Water boreholes

Financial Resources	Liquid assets (cash crops, livestock)	Liquid assets (cash crops, livestock)	Liquid assets: crops (maize), livestock (chicken, cattle), fish	Liquid assets: fish, cash crops, charcoal, and blacksmithing and carpentry products	Liquid assets: agricultural products and charcoal	Fish selling Crop selling Casual labor	Liquid assets: cash crops, livestock and charcoal
Human Resources	Charcoal making capability Marketing capability	Charcoal burning capability Farming capability	Farming capability Fishing capability Craft making and bricklaying capability	Fishing capability Agricultural capabilities Carpentry and blacksmithing capabilities	Crop cultivation capabilities Animal husbandry capabilities	Farming capability Fishing capability Marketing capability	Farming capability Bricklaying capability Charcoal production capability
Social Resources	Cooperatives	Charcoal association Agricultural cooperatives	Farming cooperative	Women's club Business associations Multi-purpose cooperative		Multi-purpose cooperative Women's club	

Human capabilities are very important to cope with climate hazard impacts: they allow communities to diversify their incomes in order to reduce their vulnerability to climate hazards.

Social resources are also very important, since associations, cooperatives, and women's clubs play an important role in product commercialization and are therefore crucial for income generation and diversification.

A wide variety of natural resources (trees, bees, mushrooms, arable land, grass, water, animals, fish) are also important to cope with climate hazards, as they allow livelihood diversification. They also provide wild foods when crops fail, medicines, and a wide array of saleable products.

Many coping mechanisms (e.g. buying mosquito nets, food, medication and seeds) require financial resources, so liquid assets (e.g. cash crops, livestock, fish, honey and charcoal) are also considered crucial.

4.3. Links between Project Activities and Climate Change Vulnerability and Adaptation

The impacts of development project activities on livelihood resources that are either impacted by climate change or important for coping will influence local populations' vulnerability and adaptation strategies. As mentioned earlier, resource management practices can either increase or diminish people's vulnerability and adaptive capacity.

Most project activities analyzed with CRiSTAL had both positive and negative potential impacts on the livelihood resources that are important for people's adaptation. Going

through the CRiSTAL process provided the opportunity for project teams to understand more clearly the links between project activities and climate change vulnerability and adaptation. Project teams were able to come up with small modifications to their project activities in order to decrease potential negative impacts on livelihood resources, enhance positive impacts, or transform neutral impacts into positive impacts. Completion of the synergies and barriers matrix allowed project teams to see if these modifications were feasible and which barriers would need to be removed.

This vulnerability assessment was also useful in sensitizing project teams, government officials and communities on the necessity of including climate change as an important issue in decision making. Climate change, its causes, impacts, and how we can tackle it, is often not well understood by development project teams and decision makers.

5. CONCLUSION

Through the climate change vulnerability assessment in Zambia, we met the three following objectives:

1. We got **an indication of the risks related to climate change at the local level for the full-size project proposal**. Community consultations on 7 sites, covering 4 provinces and 3 agroecological zones of Zambia, revealed a rise in the frequency and severity of extreme events, including droughts, floods and high temperatures, and a decrease in the length of the rainy season. Droughts and extreme heat events are widespread and are considered major climate hazards throughout the country. Heavy precipitation events are also widespread and increasing in frequency, and are causing greater damage in river valleys and floodplains (e.g. along the Zambezi river). The rise in extreme climatic events is negatively affecting the natural, physical, financial, and human resources that are crucial for people's livelihoods, and is leading to increased food insecurity and health issues. When facing climate hazards, small scale farmers (which are negatively affected by disruption of their normal farming cycles) rely heavily on access to alternative natural resources from forests and wetlands.

Recommendations for the full-size “Climate Change and Development” project:

- Should focus on increasing resilience of communities towards the risks identified in the vulnerability assessment, i.e. resilience towards the impacts of droughts, floods, increased temperature, and a reduced rainy season.
- Strategies to increase resilience should build on the communities' current coping strategies to climate variability, and should aim to enhance livelihood resources that are either impacted by climate hazards or important for coping with the impacts of those hazards.

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ANNEX 1: MISSION AGENDA

Saturday, March 24

- Departure of Anne to Lusaka airport, flight back to Geneva
- Departure of Beatrice to the IUCN-ZBWP site (Lukulu District) at 15h00; Arrival

- 8h00-19h00: Drive to Finland-funded Programme for Luapula Agriculture and Rural Development (PLARD) site, located in Mansa District, Luapula Province

Monday, April 9th, 2007

- 9h00-10h00: Meeting with PLARD
- 11h00-15h00: Farmer Consultation 1: Valley system
- 16h00-18h00: Input of data into CRiSTAL

Monday, April 16th, 2007

- 9h00-19h00: Drive to Choma and Livingstone, Southern Province
- People from Forestry Department working on PFAP were not present in either Choma or Livingstone and had not prepared our visit

ANNEX 2: LISTS OF PARTICIPANTS

1. Beekeeping Committee Members, Village #14, Mufulira District

1. Roidah Kabinga, Chairperson
2. Rhodah Paison, V I Chairperson
3. Jane Sambaulu, Secretary
4. Richard Chambaywo, V I Secretary
5. Isaac Chipayeni, Treasurer
6. George Kombe
7. Sambaulu Kasanga
8. Regina Chileshe
9. Dainess Yotamu
10. Maureen Muyomba
11. Mary Musonda
12. Siyambuli Mishecu
13. Mwebe David
14. Loveness Kapenya
15. Maria Kapepa
16. Betty Chikasa

2. Charcoal Burners' Association, Mufulira District

1. Victor Chilongo, Chairperson
2. Moses Tom Njamba
3. Peter Kaula
4. Henry Kakoma
5. Chime Sam
6. Richard Kakoma
7. Sunday Mbumba
8. Elias Simumba
9. Chileuwa Bwalya
10. Alex Musenge Mwansa
11. Augustine Samundelu
12. Godfrey Chibwe
13. Mpundu Chibwe
14. Nicodemus Kapinga
15. John Mwila
16. Victor Mambwe
17. Mary Phiri
18. Janet Kaunda
19. Matias Mumba
20. Febian Mwewa
21. Euaristo Mwanshibulwa

22. Agness Nkala
23. Alex Dgashima
24. Joseph Mwansa
25. Justine Lonawe

3. Samunyingi Village, Lukulu District

1. Francis Masheke - Induna Samunyingi (M)
2. Sendoi Masheke (M)
3. Kalaluka Masheke (M)
4. Maureen Sifuba (F)
5. Kahilu Sokayuta (F)
6. Nalishebo Akapelwa (F)
7. Namatama Akapelwa (F)
8. Mary Masiye (F)
9. Mungangami Kamana Manga (M)
10. Agatha Muyambongo (F)

4. Valley System, 09/04/2007

1. Henry Chilufya, Facilitator and translator, Forestry Officer
2. Winkler Siluyele, Agriculture and Fisheries Department, Ministry of Agriculture and Cooperatives (MACO)
3. Rayford B. Mambwe (M)
4. B.M. Mushota (M)
5. Aram Katongo (M)
6. Chibelele Alfred (M)
7. Abraham Musonda (M)
8. Chishala Dammah (M)
9. Chabala Gift (M)
10. Goodson Nkendu (M)
11. Bertha N. Ponda (F)
12. Rabeccah Chabala (F)
13. Fece Mwandwe (F)
14. Kabwita Margie (F)
15. Chiyomena James (M)
16. Mwewa Bernard (M)
17. Dages Ponde (M)
18. Dekin Kunda (M)

5. Plateau System, 10/04/2007

1. Henry Chilufya, Facilitator and translator, Forestry Officer

2. Moonle Lusters (M), Kalaba Camp Officer
3. Chibaye Stanley (M)
4. Chola John (M)
5. Daniel Wilson Chola (M)
6. Boniface Mwaba (M)
7. John Mpundu (M)
8. Justine Chola (F)
9. Barnabas Mwansa (M)
10. Charles Mushimba (M)
11. Mwewa John (M)
12. Moses Chipili (M)
13. Ackson Chabecha (M)
14. Mpun Dunoah (M)
15. Yolanda Mumba (M)
16. Richard Kunda (M)
17. Godfye Mwape (M)
18. Wilson Chola (M)
19. James Mweshi (M)
20. Everlyne Mwewo (F)
21. Mr Christanbala (M)
22. Mwansa (M)
23. Wilson Mwansa (M)
24. Balusaka (M)
25. Alan Chibesa (M)
26. Roidah Bwalya (F)
27. Foster Mwelwa (F)
28. Rose Chila (F)
29. Doreen Chilufya (F)
30. Moreen Mwandwe (F)
31. Elizabeth (F)
32. Margie Mwelwa (F)
33. Rozalia K. Chitalu (F)
34. Musaba Musenge (M)
35. Agness Kunpa (F)
36. Abraham Katungo (M)
37. Matipa Nicodemas
38. Peter Chisuala (M)
39. Chitambala Benny (M)
40. Chiasaya Peter (M)
41. Cosmas Safe (M)
42. Erika Kalaba (F)
43. Stephen Mwewa (M)
44. Danny Mibenge (M)
45. Donald Mwewa (M)
46. Lackson Chitamfya (M)
47. Masonda Bernard (M)

6. Lake System, 11/04/2007

1. Henry Chilufya, Facilitator and translator, Forestry Officer
2. Godwin Chitamuica, Fisheries Department, MACO
3. Peter Kapenigwe (M)
4. Mwaba Luance Chilolah (M)
5. Kalima Benson (M)
6. Chipulu Sunga (M)
7. Alice Ngolo (F)
8. Mary Mpundu (F)
9. Borwface Chilufya (M)
10. Freddy B. Somuwa (M)
11. Innocent Mwanso (M)
12. Tobias Mumba (M)
13. Wuam Mwaba (M)
14. Paul Chipulu (M)
15. Justina Mumba (F)
16. Protasio Mkianashiku (M)
17. Florence Mushibwe (F)
18. G. Mubanga (M)
19. Tresphord Mubanga (M)
20. Sebgo Muselela (M)
21. Peter Mumba (M)

7. Climate Change Briefing with Government Officials, Mansa, 10/04/2007

1. Beatrice Riche, IUCN
2. Jonathan Chilembo, Provincial Meteorological Officer, Meteorology Department
3. Blackson P. Jeke, Provincial Agriculture Officer, Agriculture Department
4. Blackson T. Ndhlovu, Assistant Secretary, Provincial Administration
5. Annie M. Magayane, Senior Agriculture Information Officer, Agriculture Department
6. Sidney Maboshe, Principal Fisheries Coordinator, Department of Fisheries
7. Alex Kabwe, Agriculture Specialist, Agriculture Department
8. Evans Kanda, Extension Assitant, Forestry Department
9. Guni Mickels Kokwe, Chief Technical Advisor, PLARD
10. Henry Chilufya, Senior Technician, Forestry Department

8. Debriefing meeting with PLARD team, Mansa, 12/04/2007

1. Beatrice Riche, IUCN
2. Sidney M. Maboshe, Principal Fisheries Officer, Department of Fisheries, MACO

3. Abraham Ngoliya, Chief Research Officer, ZARI and MACO
4. Mighten K. Mpiya, Programme Director, PLARD
5. Guni Mickels Kokwe, Chief Technical Advisor, PLARD
6. Njekwa Mukamba, Programme Assistant, PLARD
7. Annie Magayane, Senior Agriculture Information Officer, Agriculture Department, MACO
8. Joseph Chanda, Treasurer, Mansa District Farmers Association

ANNEX 3: CONTACT DETAILS

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Perry Mwawda, Forest Department, Livingstone; telephone: 03-321484

Charles E. Muleya, Chairman of the Forest Management Group, House #ME82, Livingstone; cell phone: 097-687085

Bernard Sinyangwe, Livingstone District Forestry Officer, P.O. Box 60066, Livingstone; telephone: 03321489, cell phone: 097-333044 or 096-136157

Charles M. Taulo, Principal Extension Officer, P.O. Box 630116, Choma; tel/fax: 220491, email: fdsouthern@yahoo.com and cmtaulo@yahoo.com

ANNEX

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IPCC. 2007. Climate change 2007: Climate change impacts, adaptation and vulnerability. Summary for policymakers. A report of the Working Group II of the Intergovernmental Panel on Climate Change. Fourth Assessment Report. 23 pp.