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**Australian Agricultural Economics and Resources Economics Society  
55TH Annual Conference-Melbourne, Australia 8-11 February 2011**

**CLIMATE CHANGE AND POVERTY REDUCTION IN SAHEL: CLIMATE  
RISK MANAGEMENT CONTRIBUTION TO POVERTY REDUCTION**

**(MITIGATE POLICIES)**

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**Abstract**

Nowadays climate change event and poor population vulnerability become more severe and natural resources scarcity intensity increased. In order to mitigate climate change negative effects adaptive policies such as poverty reduction Strategy and National Adaptation Plan of Action (NAPA) as effective's responsive strategies. There are also farmers traditional adaptation methods which are consider as local mainstreaming climate change adaptation framework.

This paper has explore subjective qualitative evaluation of climate change risk management framework strategic and link its with poverty reduction strategy in the Sahel .Sahel is one of the most vulnerable areas in the world with lower HDI(0.2%) and have the highest poverty rate (over 45% of the people live below the poverty line).

The study was focused on 9 Sahel countries (Senegal, Mauritania, Mali, Niger, Burkina-Faso, Nigeria, Chad, Soudan and Eritrea) and their Poverty Reduction Strategy Papers (PRSP) and National Adaptation Programmes of Action (NAPA) by assessing criteria such as: a) the consideration of climate change scenarios and the vulnerabilities of the country; b) the analysis of poverty-climate links; and c) the climate change institutional framework of the country. However Soudan and Eritrea don't have PRSP and Nigeria don't have NAPA.

The results show that most Sahel countries does not included Climate change

effect in their PRSP (except Burkina-Faso) but have a better performance with NAPA framework elaboration. Burkina-Faso is Climate risk management model country in the region but policies have failed because of farmer's difficult conditions to get access to credit and lack of good technical supports. NAPA and PRSP objectives did not achieved because majority of poor were excluded, inefficiency in domestic accounting systems and inefficient monitoring. Furthermore, donors funding problems, natural disasters such as floods or droughts; biophysical modeling and simulation insufficient data, lack of skilled labor are others reason.

To conclude, it is illustrates that mainstreaming natural hazards into PRSP and the development of NAPA are a step forward into establishment of institutional process to incorporate climate change into national policies. The World Bank and the UNFCCC should coordinate efforts to support developing countries in their efforts to incorporate adaptation to climate change in PRSP. Country need to strength the coordination, networks and information flows between ministries, at different levels of government and civil society to have more efficient integration of climate change variables into poverty reduction and development strategies. Country's should also have sustainable funding and should not rely only on donor. Policies should target more vulnerable peoples, need good policies implementation and good monitoring.

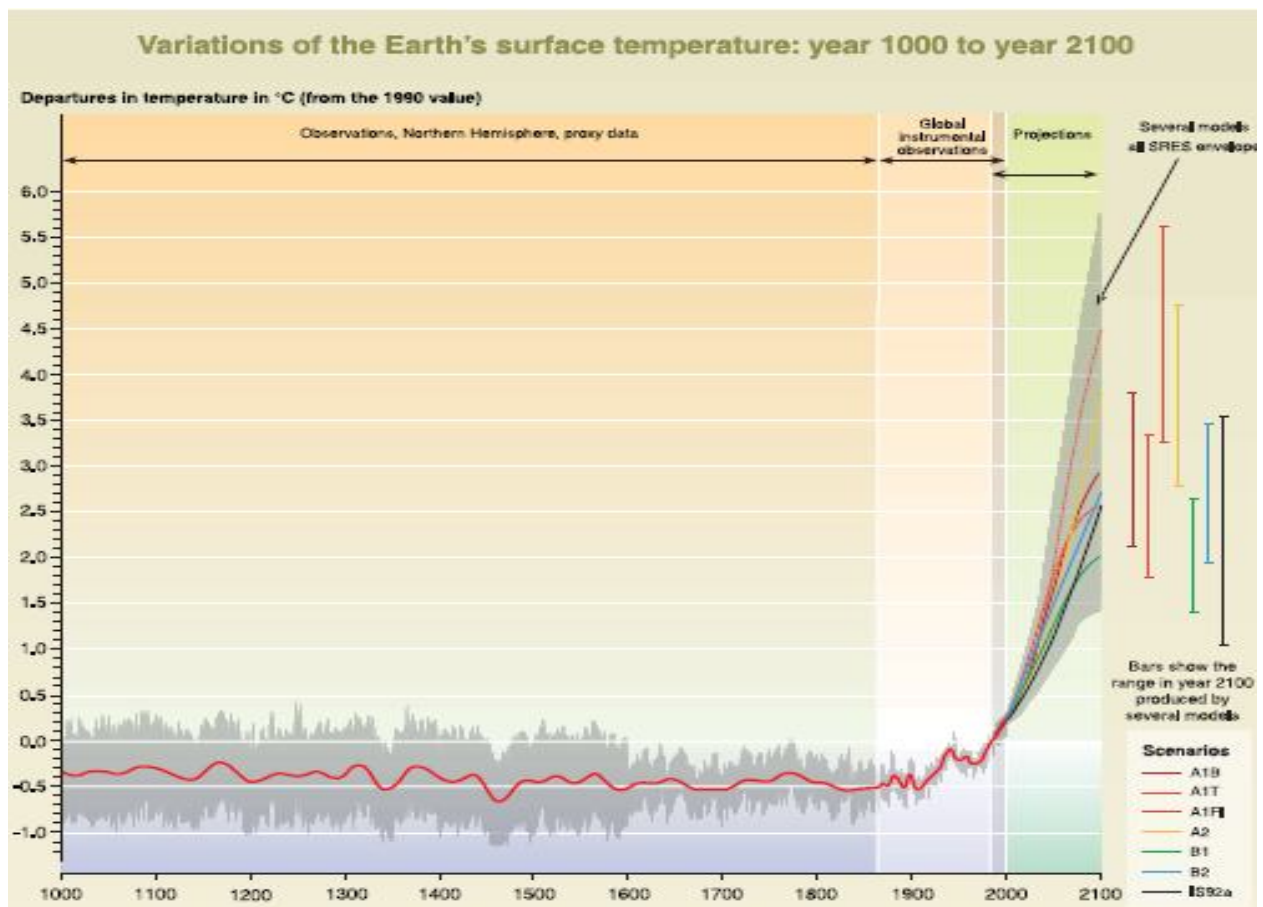
Key-word: Sahel, Climate Change, Poverty Reduction, Adaptation Strategy.

## I- Introduction:

Currently over 1 billion peoples include two thirds of women population live in extreme poverty with less than US\$1 per day. This figure rose to 2.8 billion if a standard of US\$2 a day is used (OECD, 2001).Poverty is admittedly multidimensional, involving income, living conditions or social relationships. Other fundamental caused of poverty are limited and insecure access to the natural resources (land, clean water, forest etc.) that would enable to generate income, capacities, self reliance and security.

Today, it is widely agreed by the scientific community that there is link between climate change impact and poverty rate. The rate and duration of warming observed during the twentieth century are unprecedented in the past thousand years. The increases of maximum and low temperatures, hot days numbers, and the heat index have been observed over nearly all lands during the second half of the twentieth century. Collective evidence suggests that observed warming over the past fifty years can be mostly attributed to human activities. The warming trend in the global average surface temperature is expected to increase and projection show that the temperature will increase from 1.4 to 5.8°C by 2100 in comparison to 1990 (IPCC 2001).

Graph1: Variation in the earth's surface temperature 1000-2100.



Source: IPCC 2001 a.

There is increasing observational evidence that regional changes in climate have contributed to various changes in physical and biological systems in many parts of the world (IPCC 2001a; 2001b). These include the shrinkage of glaciers, thawing of permafrost, changes in rainfall frequency and intensity, shifts in the growing season, early flowering of trees and emergence of insects, and shifts in the distribution ranges of plants and animals in response to changes in climatic conditions.

On the regional level, climate change is superimposed on the existing climatic conditions and manifests itself through:

- Changes in average climatic conditions. For example, some regions may become drier or wetter on average (IPCC 2001a).
- Changes in climate variability. For example, rainfall events may become more erratic in some regions.
- Changes in the frequency and magnitude of extreme events (IPCC 2001a; 2001b).
- Changes in sea levels, which are projected to rise by between 0.09 and 0.88 meters by 2100 relative to 1990 (IPCC, 2001).

The impacts of climate change vary across geographical regions (IPCC, 2001).

Pict1: Flood in 2001

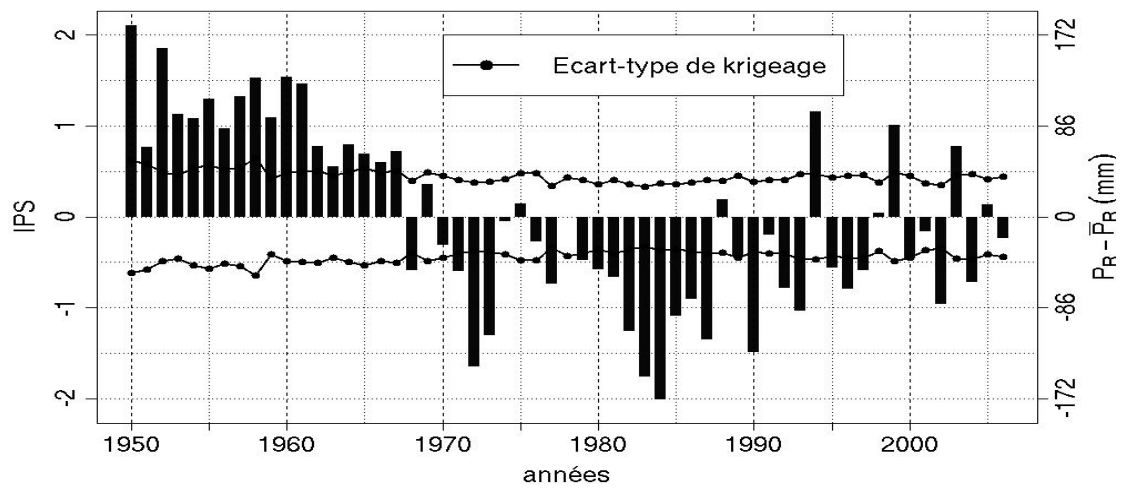


Source:IPCC,2001

Sahel climate has suffered large variation after the rupture period in 1970 (Graph2, Grap3).

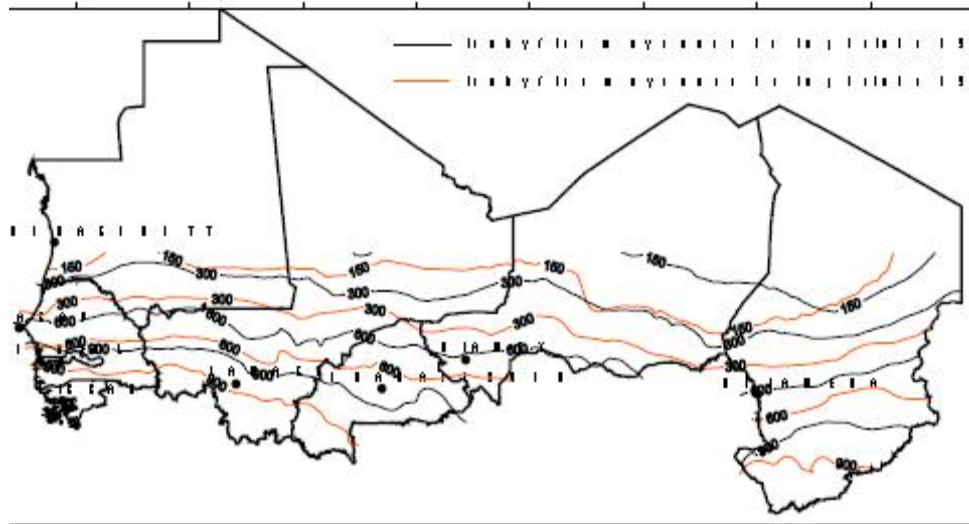
Graph2: Rainfall Variation 1950-2010 , Years 1950 – 1970. Wet dry Years

1970-1980 • from 1990, but starts back deficit of persisting problem



Source: A. Ali and Al 2008

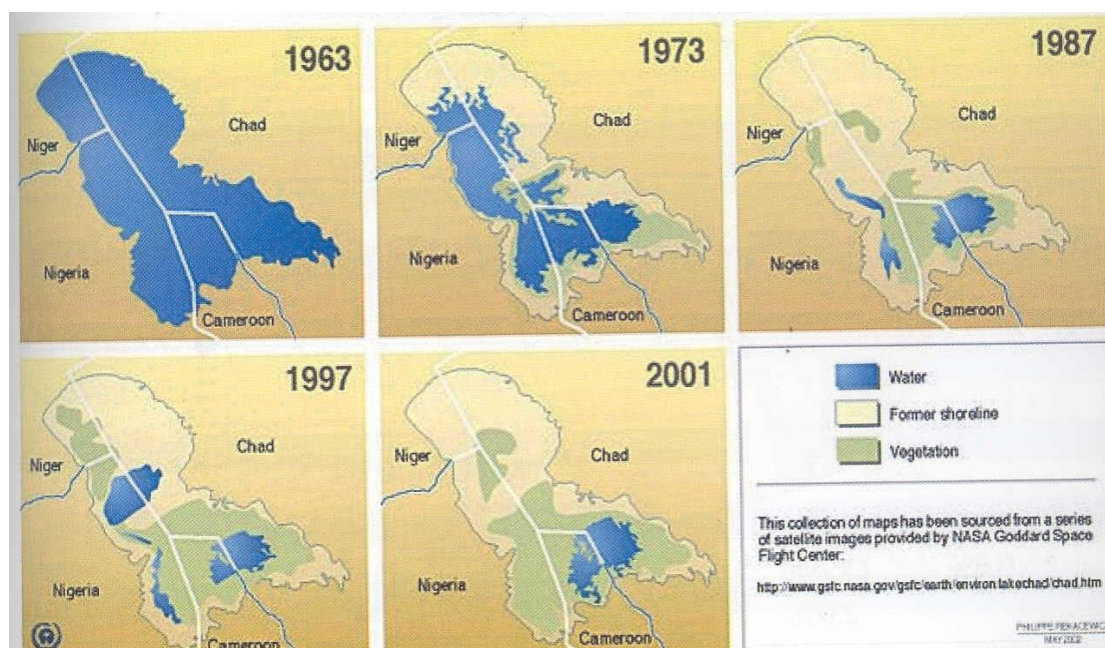
Graph3: Slip isohyets after breaking climate



source : A. Ali and Al 2008

- This variation had many impact on the region namely:
  - ✓ Extremes weather events such as droughts which effect lakes and rivers hydrological regime, the phenomenon of relatively low water delivered, draining problem at some water points and livestock mortality related to desiccation of watering points (Pict2,Pict3).

Pict2: Lake Chad drying



Source :CILSS,2009

Pict3: Mortality of chapel



Source :CILSS,2009

- The impacts of climate change on food security:
  - ✓ The resurgence of pests, including the invasions of locusts would be correlated with climate change exacerbating food insecurity in affected areas.
  - ✓ The observed variations in crop yields are due to climate change e.g. the combined action of drought and locusts in the Sahel between 2004-2005 has cause considerable loss of agricultural production (Pict4).

Pict4: Cereal deficit in 2005



Source: CILSS, 2009

Note also the phenomena of flooding of the population claim to the high precipitation(Pict5).

Pict5: Niger flood (Niamey at 2002)



Source :CILSS,2009

The floods have seriously affected the livelihoods conditions and have caused their: migration, job insecurity, and living resources lack facilities.

These situations make the Sahel region over one of the most vulnerable because of:

- High rates of poverty and heavy dependence of populations to natural resources;
- Fragile ecosystems;
- Agriculture mainly rainfall;
- Precarious infrastructure; and
- Weak institutional capacity, economic, scientific and technology.

According to CILSS, "global warming may accelerate the phenomenon of drought and floods resulting in: Water resources weakening; Lower crop yields and Crop diseases increased prevalence. That situation added to sharp increase of energy and food prices could exacerbate food insecurity and poverty. Climate change has also increase difficulties to have access to clean water, increase land degradation and limit access to arable land. This affected poor peoples well being which already was deteriorated with lack of clean water facilities, lack of sufficient arable land and low income. Climate change has considerable impact on MDGs achievement (see table1)



Table1: Potential impact of climate change on the Millennium Development Goals.

Millennium Development Goals: Climate Change as a Cross-Cutting Issue	
Millennium Development Goal	Examples of Links with Climate Change
Eradicate extreme poverty and hunger (Goal 1)	<ul style="list-style-type: none"> <li>● Climate change is projected to reduce poor people's livelihood assets, for example, health, access to water, homes, and infrastructure.</li> <li>● Climate change is expected to alter the path and rate of economic growth due to changes in natural systems and resources, infrastructure, and labor productivity. A reduction in economic growth directly impacts poverty through reduced income opportunities.</li> <li>● Climate change is projected to alter regional food security. In particular in Africa, food security is expected to worsen.</li> </ul>
Health related goals: <ul style="list-style-type: none"> <li>● Combat major diseases</li> <li>● Reduce infant mortality</li> <li>● Improve maternal health (Goals 4, 5 &amp; 6)</li> </ul>	<ul style="list-style-type: none"> <li>● Direct effects of climate change include increases in heat-related mortality and illness associated with heat waves (which may be balanced by less winter cold-related deaths in some regions).</li> <li>● Climate change may increase the prevalence of some vector-borne diseases (for example malaria and dengue fever), and vulnerability to water, food, or person-to-person borne diseases (for example cholera and dysentery).</li> <li>● Children and pregnant women are particularly susceptible to vector and water-borne diseases. Anemia – resulting from malaria – is responsible for a quarter of maternal mortality.</li> <li>● Climate change will likely result in declining quantity and quality of drinking water, which is a prerequisite for good health, and exacerbate malnutrition – an important source of ill health among children – by reducing natural resource productivity and threatening food security, particularly in Sub-Saharan Africa.</li> </ul>
Achieve universal primary education (Goal 2)	<ul style="list-style-type: none"> <li>● Links to climate change are less direct, but loss of livelihood assets (social, natural, physical, human, and financial capital) may reduce opportunities for full-time education in numerous ways. Natural disasters and drought reduce children's available time (which may be diverted to household tasks), while displacement and migration can reduce access to education opportunities.</li> </ul>
Promote gender equality and empower women (Goal 3)	<ul style="list-style-type: none"> <li>● Climate change is expected to exacerbate current gender inequalities. Depletion of natural resources and decreasing agricultural productivity may place additional burdens on women's health and reduce time available to participate in decision making processes and income generating activities.</li> <li>● Climate related disasters have been found to impact more severely on female-headed households, particularly where they have fewer assets to start with.</li> </ul>
Ensure environmental sustainability (Goal 7)	<ul style="list-style-type: none"> <li>● Climate change will alter the quality and productivity of natural resources and ecosystems, some of which may be irreversibly damaged, and these changes may also decrease biological diversity and compound existing environmental degradation.</li> </ul>
Global partnerships	<ul style="list-style-type: none"> <li>● Global climate change is a global issue and response requires global cooperation, especially to help developing countries to adapt to the adverse impacts of climate change.</li> </ul>

Source: IPCC

However, as in most of low income countries, many policies are implementing to reduce the effect of climate change in the Sahel region where poor people's vulnerabilities to natural risk are become higher. Policies such as the consideration of climate change scenarios and the vulnerabilities of the country, the analysis of poverty-climate links; climate change and the institutional framework of the country are putting in place. All this are including in countries Poverty Reduction Strategy Papers (PRSP) and National Adaptation Programs of Action (NAPA) process.

According to the World Bank report 2007, there are about 70 low-income countries involved at a certain stage of the PRSP process, which is a requirement for

receiving debt relief under the enhanced Heavily Indebted Poor Countries (HIPC) initiative and concessional assistance from the World Bank and International Monetary Fund (IMF) (World Bank 2007).

Today, the United Nations Development Program-European Commission Poverty and Environment, donors, NGOs and policy-makers are shifting policies or advocating an alternative” environmental entitlements “approach to understanding poverty-environment linkages (UNDP-EC,2002) and are establishing climate change adaptation measure to poverty reduction. Policies are also implementing at farmers level, as own farmers climate risk management adaptation method.

This study purpose is to evaluate climate change risks management policies in the Sahel region in line with poverty reduction and development strategies.

## II- Methodology:

To achieve the aim of this study, in first step farmer’s climate change risk management strategic developed by owns farmers is presented as climate change traditional adaptation and the limit.

In second part, this study provides a subjective qualitative framework that looks at the integration of adaptation to climate change and climate risks management into poverty reduction and development strategies in the African Sahel region. It assumes that PRSPs and NAPAs are the best source of official information provided by countries to make a coherent assessment (Arnoldo Matus Kramer, 2007).

It is important to acknowledge the temporal boundaries of the assessment. PRSPs and NAPAs are ongoing processes. Adaptation to climate change is just in the recent years playing a key role in the international agenda at the UNFCCC and in the development community. This paper has considered 9 Sahel countries (Senegal, Mauritania, Mali, Burkina-Faso, Niger, Nigeria, Chad, Soudan and Eritrea) those PRSPs and NAPAs that have been available through the websites of the World Bank and the UNFCCC through the end of June 2010.

It could be the case that countries are integrating adaptation to climate change and climate risk management by a different national process, without a NAPA, and that the process has not been reflected in their PRSP.

The assessment framework used in this paper built on previous work and ideas on mainstreaming the environment in PRSP done by Bojo (2004) and used also by Arnoldo (2007). The term “mainstreaming” is used to describe the three main criteria:

**a) The consideration of climate change scenarios and vulnerabilities for the country;**

- b) The analysis of poverty-climate links; and**
- c) The climate change institutional framework of the country.**

These criteria are broken into five variables that assessed each country and their respective PRSPs and NAPAs, if available. A description of these variables is provided below:

**a) The consideration of climate change scenarios and vulnerabilities for the country:**

1. **Mention of Climate Change:** recognition of climate change as a policy challenge or threat for development and/or the incorporation of climate change in a national programme or project.
2. **National Climate Change Scenarios:** description of national climate change scenarios and/or the use of climate change models for describing national vulnerabilities.
3. **Regional Climate Change Scenarios:** the use of regional models or the downscaling of GCM at a regional scale. They are used to have a greater resolution for climate change scenarios at the regional scale.
4. **Identification of Sector/Community Vulnerabilities:** issues related to a clear identification of vulnerable communities or sectors to climate change.
5. **Research Gaps and Needs:** identification of research priorities in modeling, analysis of vulnerabilities and adaptive capacity.

**b) The analysis of poverty-climate links:**

1. **Mention of Poverty-Climate link:** identification of climate as a risk for the eradication of poverty and development goals.
2. **Identification of a particular Poverty-Climate problem:** identify any issue related to climate variability or extreme weather events with a negative impact on poverty eradication or development. Attention was given to events such as droughts/aridity, erratic rainfall, floods, sea level rise, tropical cyclones, extreme heat and extreme cold.
3. **General Analysis of a Climate-Poverty problem:** to give a general analysis of how droughts/aridity, erratic rainfall, floods, sea level rise, tropical cyclones, extreme heat and extreme cold affects a vulnerable community or sector.
4. **Solution identification in a Sector/Community:** identify any programme, project or policy that help reducing present or future vulnerability to droughts/aridity, erratic rainfall, floods, sea level rise, tropical cyclones, extreme heat and extreme affecting a vulnerable community or sector.
5. **Gaps and Needs:** identification of clear gaps and needs in current programmes, projects and policies related to human and scientific resources in relation to climate-poverty links.

**c) The climate change institutional framework of the country:**

1. **Mention of Climate Change Institutional Framework:** identification of a climate change constituency.
2. **NAPA:** identification or development of a NAPA.
3. **National Institutional Framework:** issue related to a national multi-sectoral climate change institutional mechanism. In some countries an interministerial Commission has been established.
4. **Regional/Local Institutional Framework (Civil Society):** to have a regional or local permanent and solid institutional framework that allows the interaction between authorities at the national, regional, state and local level and with local civil society.
5. **Adaptation Projects:** identification of a set of adaptation projects priorities and a coherent institutional capacity for the implementation phase.

### Scoring System

The assessment of the countries and their PRSPs and NAPAs across the 15 variables is based on a qualitative judgment. All variables received a score with respect to each country's:

**0** = not mention or not elaborated

**1** = mention, identification or elaboration of the concept.

For each criterion the country could score a range of 0-5 depending on the level of attention given to the criteria. In total each country could score 15.

Though the assessment does not intend to be scientifically precise is a good indication of the level of integration of adaptation to climate change and climate related risk management into the national development policies. The interpretation of the scores is as follow:

**0-5** = Little or no progress in the integration of adaptation to climate change and climate risk management

**5-10** = Awareness of needs. The country has a growing level of awareness and understanding of the value and requirements of mainstreaming, and recognizes the need for action. It may also have decided to take action.

**10-15** = Development of Institutional response and solutions. It refers to an intermediate stage, where the country is developing plans and tools to address the requirements of mainstreaming adaptation to climate change and where climate risk reduction is address within an institutional natural disaster management and under the national development process.

It is important to consider that the results can have a different interpretation by considering a) the level of vulnerability to climate variability, extreme weather events and climate change of a country as an incentive to invest in the integration of adaptation to climate change and climate risks management into poverty reduction and development strategies; and b) the resources of a particular country to address these issues.

### III- Analysis, Result and discussion

This first section is to present farmer's traditional climate change risk management method.

Farmer's face climate change impacts on their productions, incomes, living environment and limited agriculture resources available, has developed own climate change risk adaptation by changing their production behavior:

- Thought and social relations modes;
- Practices and agricultural techniques to survive and raise their incomes:
  - ✓ Through diversification of agricultural production;
  - ✓ Rational choice for speculation;
  - ✓ Widespread use of farmers' seeds adapted to the vagaries of climate (early varieties, such as cowpea);
  - ✓ Direct seeding (zai technical) rather than plowing encouraging erosion. Via agro-ecological practices improved fallows;
  - ✓ Organic manure using (compost, manure contracts, stables, etc..) Intercropping. Via integration on a single holding of Agriculture and Livestock ;
  - ✓ Via restoration of natural resources;
  - ✓ The revegetation ;
  - ✓ Techniques of soil conservation;
  - ✓ Techniques of water conservation;
  - ✓ Assisted natural recovery.
- Food fads;
- Markets and rules for fixing producers and consumers prices functioning;and
- Migration

The human scale and geographic mobility that depends on the type and extent of the disaster caused by climate change:

- ✓ Low scale: migration of some family members in search of cash income for the supply of family food;
- ✓ Large scale: Migration of the entire household and their goods to other areas more conducive; and

L'amplitude géographique de la migration peut se limiter au niveau du pays, vers un autre pays ou vers d'autres continents.

- Other coping strategies and populations survival:
  - ✓ In years of water shortage: use of collection (wild fruits, vegetables, cram-cram, etc...) And the practice of alternative activities (gardening, beekeeping, etc.);

- ✓ In years of good rainfall: stockpiling and hoarding in kind (livestock purchases) or cash.

Indeed, the traditional climate change risk management strategic developed by own-farmers are limited by both financial and technical support facilities (financial and technologic transfer) .Technology transfer does not take into account the development of farmer monitoring strategic .Therefore, nowadays we assist at the disappeared of their traditional risk management that are more efficient than new methods according to their longer experience to do.

This section presents all 9 African Sahel cross-country comparison of the penetration of climate change variables, first into the PRSP process and, second, into the assessment of both the PRSP and NAPA for countries that already have developed NAPA, still 2010.PRSP and NAPA document collected show that only Soudan and Eritrea still 2010 do not have PRSP and Nigeria in PANA case. All is summarize in table2, Table3 and Table4.

The analysis of Table2 shows the resulting scores by country of their PRSP assessment. It demonstrates that some governments have made little progress in incorporating climate change into their PRSPs with Burkina-Faso (11/15), Nigeria (10/15), Mali(9/15).Other countries like Niger, Senegal and Chad have poor scoring.

Nevertheless, most countries showed a better performance in the criteria b) Poverty- Climate links. This criteria refers to climate variability or extreme weather events that have been identified to have a negative impact on poverty eradication such as droughts/ aridity, erratic rainfall, floods, sea level rise, tropical cyclones, extreme heat and extremes affecting vulnerable communities or sectors. All these factors are usually covered by the countries in their natural hazards management plans, which have been mainstreamed into their PRSPs in most of the selected countries. Usually, countries that are frequently impact by natural hazards is better scored. We have some example such at:

At Niger, with high temperature drought has increased much disease as measles and increases mortality. During 1995-1996 at Niger, 69.101 peoples have died with 748/100.000 by incidence and 1% by lethality (SAP/GC, 1996).Flood and drought have create a good condition for disease propagation and malaria are the most dangerous that affect annually 9867/100 000 peoples with 13,69/100 000 mortality rate (Niger Government,2006).

Senegal has experimented in recent decade several drought events which has affected whole the country especially peri-urban area. Furthermore erosion are affecting from north to south the country principal area near the sea and have caused the destruction of several public as private development infrastructure. River and

underground water resources are also victims of salinity due to the contamination by sea water (UNFPA, 2006).

In Mauritania Rainfall in August and September 2009 confirmed the fears of serious risk of natural disasters in years to come resulting from rising sea levels, greater erosion of coastal zones, destruction of the mangroves, and devastating floods. A walk close to “Cité Plage” reveals the effects—the collapse of the coastal dune bar which can no longer keep out water even when it rains lightly and during high tide. According to recent studies commissioned by Mauritanian authorities, 79% of the overall surface area of Nouakchott could be under water in fewer than 10 years and in 20 years at most (Mauritania Government, 2010). The worst-case scenario projects the disappearance of the city around 2050.

Moreover, the history of natural hazards in the Sahel region has increased this recent year with chronically flood and drought.

There are two main reasons to consider climate variability and extreme weather events for the assessment. One is that it is widely recognized that to enhance resilience to present climate variability and extreme weather events is an important step forward to integrate climate change into national policies and, second, an assessment of the relationship between Poverty-Climate Change links. Table shows that only Senegal, Mali, Burkina-Faso and Nigeria include the concept of linking climate change and poverty into their PRSP.

Most countries have little recognition of climate change in their PRSP, indeed just 4/7 countries mention climate change in their entire PRSP document. Countries like Niger, Mauritania, and Chad do not mention climate change in their PRSP at all and that show again the importance of climate change effect is really recognized in most of Sahel poverty reduction strategic. Burkina-Faso is one of the most Sahel countries that scored on the variable of “Adaptation Projects” in their PRSPs” and the first Sahel country that has written his PRSP document.

Whatever Burkina-Faso is not the most vulnerable country in terms of high poverty rate and high natural disaster events risk. This is introduced in the country dynamism to reduce his poverty rate and achieve MDGs purpose compared to other African Sahel region countries. Burkina-Faso belongs to the groups of heavily indebted poor countries that are eligible for the HIPC (Highly Indebted Poor Countries) initiatives. The country qualified for the first HIPC initiative (HIPC1) during the fall of 1998 and benefited for debt relief at completion point in July 2000 (Yves Bourdet and Inga Persson, 2001). It was among the first country to produce a full Poverty Reduction Strategy Paper (PRSP) and to qualify for further debt relief (HIPC2) in July 2000.

Countries like Soudan and Eritrea are more vulnerable with high poverty but there is not politic leadership to implement such policies. This situation is increasing household vulnerability to chronic poverty and extreme climate change event.

Burkina- Faso in term of PRSP and climate change risk management has the best practices. The Burkina-Faso government has put in place at lot framework such:

- ◆ The strategic framework of the fight against poverty (PRSP);
- ◆ The Rural Development Strategy (RDS);
- ◆ The National Plan of Fight against Desertification (PNLCD);
- ◆ The National Action Plan for the Environment (NAPE);
- ◆ The National Forest Policy;
- ◆ Strategies and action plans for implementing the Rio conventions that are National Action Plan for the Fight against Desertification (NAP / CD), the national strategy and action plan on biodiversity and strategy National implementation of the Convention on Climate Change;
- ◆ Burkina Faso National Water Resources Policy;
- ◆ The Plan of Action for Integrated Water Resources (PAGIRE);
- ◆ The energy policy of Burkina Faso;
- ◆ Land reform



Table :Adaptation to Climate															Total Scoring (0-15)	
Change in PRSP	Climate Change in PRSP(0-5)					Poverty-Climate link(0-5)					Climate Change Institutional Framework(0-5)					
Country	Mention of Climate Change	National Climate Change Scenarios	Regional Climate Change Scenarios	Identification of sector/com-munity Vulnerabilities	Research Gaps and Needs	Mention of Poverty-Climate link	Identification of a particular problem	General Analysis	Solution Identification Sector/Com-munity	Gaps and Needs	Mention of Climate Change Institutional Framework	NAPA	National Institution/ National Framework	Regional/ Local Institutional Framework (Civil Society)	Adaptation Projects	
Senegal	×	×				×	×	×	×		×		×		×	9
Mauritania	×					×	×	×	×							5
Mali	×	×				×	×	×	×		×		×		×	9
Burkina-Faso	×	×		×		×	×	×	×		×		×	×	×	11
Niger						×	×	×	×							4
Nigeria	×	×		×		×	×	×	×		×		×		×	10
Chad	×				×	×	×	×	×		×				×	8
Soudan																
Eritrea																

Table 3 shows the introduction of NAPAs. A significant improvement can be seen for all Sahel country's that proceeded to develop their NAPAs, except Federal Republic of Nigeria, have identified priority activities that respond to their urgent and immediate needs with regard to adaptation to climate change. In order to address the urgent adaptation needs of LDCs, a new approach was developed in the NAPAs by enhancing adaptive capacity to climate variability, which itself would help address the adverse effects of climate change. The NAPA takes into account existing coping strategies at the grassroots level, and builds upon that to identify priority activities, rather than focusing on scenario-based modeling to assess future vulnerability and long-term policy at the state level. In the NAPA process, prominence is given to community level input as an important source of information, recognizing that grassroots communities are the main stakeholders (UNFCCC 2007).

We have to consider related financial problems to develop the participatory approach of NAPA above described. The Regional Workshop on National Adaptation Program of Action (NAPAs) for Least Developed Anglophone African Countries in 2003 raised concerns among participants by questioning the funding for carrying out public consultations. The GEFs US\$200,000 allocation may not be sufficient to meet the needs in every country. A participant who had worked in Samoa, for example, said that the costs to conduct participatory approaches are high because of the time it takes to travel through the islands.

The influence of NAPAs in the integration of climate change into the PRSP process is at the moment to assess. Most NAPAs for the countries assessed have been published in the year 2006 (8 out of 9) and there is no evidence to claim that the NAPAs are helping to mainstream climate change into the PRSPs. The only country that has recognition of the NAPA process in the PRSP is Burkina-Faso. In contrast Mauritania, first country to develop a NAPA in the year 2004, has not incorporated any mention of NAPA or a Climate Change Institutional Framework in its PRSP published in the year 2006. We can consider that Mauritania's recognized obstacles to the implementation of NAPA are also the main obstacles for a general consideration of the NAPA in their PRSP:

- The absence of an institutional framework specific to the implementation of NAPA benefiting from operational support; the bodies National Centre for Development and Environment, Technical Centre for Development and Environment, Regional Centre for Development and Environment and others bear witness to a lack of driving force;
- The obsolete nature of the laws which exist on the environment in relation to the conventions (MEA);
- The as yet informal nature of the project as perceived by the decision-makers in general;
- The diversity of the mechanisms engaged at national level in the area of the environment without any obvious connecting relationship, which necessarily weakens the Department of the Environment (Islamic Republic of Mauritania 2004).

Nevertheless, PRSPs have certain influence in the NAPAs of the countries assessed. The NAPAs consider poor vulnerable communities and their countries PRSP into their strategies. In their process NAPAs include synthesis of available information, participatory assessment of vulnerability to current climate variability and extreme events and of areas where risks would increase due to climate change, identification of key adaptation measures as well as criteria for prioritizing activities, and selection of a prioritized short list of activities (UNFCCC 2007). As an example, Niger overall objective of the NAPA is to contribute to the alleviation of the adverse effects of climate variability and changes on the most vulnerable populations with the prospect of a sustainable development. In this area, some adaptation measures, consistent with the orientations of the PRSP contained in the Rural Development Strategy, were identified (Republic of Niger 2006).

The Mauritania new Poverty Reduction Strategy Paper (PRSP) purpose is to establish the conditions which permit the emergence of an economy that is more open to the outside world and more diversified, able to ensure sustained economic growth in the medium and long terms so as to attain lasting economic and social development enabling the country to achieve the MDGs. However, this vision should go beyond the timeline for the MDGs (2015) and become a stage in a very long-term prospective vision (2030). The new vision is in link with NAPA by proceeding in keeping with the country two of his four PRSP priorities:

- **2 priority zones:** dry rural areas and underprivileged neighborhoods;
- **2 priority cross-cutting actions:** (i) preparation of a National Territorial Development Strategy (SNAT) which incorporates a long-term prospective vision for the country (Mauritania 2030) and includes in particular the implementation of the PDALM (already available); and (ii) adoption of the National Environmental Action Program (PANE) as an important milestone in fully recognizing the cross-cutting nature of environmental issues. The focus of NAPAs is on urgent and immediate needs, those for which further delay could increase vulnerability or lead to increased costs at a later stage (UNFCCC 2007).

NAPA includes short profiles of projects and/or activities intended to address urgent and immediate adaptation needs. Its focus is to address the use of existing information, where no new research is needed. NAPA is an action-oriented, country-driven and flexible process based on national circumstances (UNFCCC 2007). It is a crucial step to coordinate the UNFCCC and the World Bank to support countries to integrate their NAPAs process into their PRSPs and development strategies. This process could enhance a cross-sectoral cooperation between the environmental and development communities in order to tackle the challenges of climate change to poverty reduction and development.

Table3

Table :Adaptation to Climate Change in PRSP and NAPA															Total Scoring(0-15)	
Country	Climate Change in PRSP/NAPA(0-5)					Poverty-Climate link(0-5)					Climate Change Institutional Framework(0-5)					
	Mention of Climate Change	National Climate Change Scenarios	Regional Climate Change Scenarios	Identification of sector/community Vulnerabilities	Research Gaps and Needs	Mention of Poverty-Climate link	Identification of a particular problem	General Analysis	Solution Identification in Sector/Community	Gaps and Needs	Mention of Climate Change Institutional Framework	NAPA	National Institutional Framework	Regional/Local Institutional Framework (Civil Society)	Adaptation Projects	
Senegal	x	x		x		x	x	x	x		x	x	x		x	11
Mauritania	x			x	x	x	x	x	x		x	x	x		x	11
Mali	x	x		x		x	x	x	x		x	x	x		x	11
Burkina-Faso	x	x		x		x	x	x	x		x	x	x		x	11
Niger	x	x		x		x	x	x	x		x	x	x		x	11
Nigeria																
Chad	x	x		x	x	x	x	x	x		x	x			x	11
Soudan	x	x		x	x	x	x	x	x		x	x	x		x	12
Eritrea	x	x		x	x	x	x	x	x		x	x			x	11

A comparison between countries scores taking into account the assessment just for PRSP and also the assessment for PRSP/NAPA combined is shown in Table4. The exercise is relevant to describe the positive relation of the development of NAPAs for those 8 countries with a NAPA document (Senegal, Mauritania, Mali, Niger, Burkina-Faso, Chad and Soudan, Eritrea) and its better performance in the scoring system of the variables assessed.

Senegal, Burkina-Faso and Niger presented their PRSP Progress Report during 2006, the same year of their NAPAs publication. There is a considerable difference in scores between the assessment of their PRSP process and the scores considering PRSP/NAPA. This tell us that that PRSP Progress Report, where Governments can make changes to the content of a PRSP and assess the progress toward PRSP goals and intended policy/program reforms, are not mainstreaming the NAPA process or at least not in the case of Senegal, Burkina-Faso and Niger.

It is important to examine those variables were there is an overall poor scoring even for those countries that have developed PRSP and NAPA. The variables where countries scored less than 5 points are the following:

- **Regional Climate Change Scenarios:** are not present in any of Sahel countries assessed. Most countries use MAGICC/SCENGEN, DSSAT and GR2M to describe National Climate Change Scenarios.
- **Research Need and Gaps in Climate Change:** most countries do not assess what are their priorities into research in terms of modeling, analysis of vulnerabilities and adaptive capacity. Burkina, Senegal and Niger are the exception. Climate change research intensity is more high at Burkina-Faso compare to other Sahel countries. Burkina-Faso are getting more help for CIRAD- Burkina, Volta-Hylicos project , AMMA-project and 2IE which are doing a lot of work with those research center. Burkina-Faso government focused part of its research on the organization of multi-disciplinary monsoon and climate management in different agroclimatic zones in order to help in maximizing the benefits of good monsoons and minimizing the adverse impact of aberrant monsoons. And considering also as an aim to take proactive action against potential adverse changes in temperature, precipitation and sea levels as a result of global warming.
- **Gaps and needs in Poverty-Climate link:** most countries do not assess gaps and needs (human and scientific resources) in current or future programs or Projects where there is a link between climate and poverty.
- **Regional / Local Institutional Framework (Civil Society):** Most of Sahel countries are part of CILSS which is the Permanent Interstate Committee for Drought Control in the Sahel.

Table4

Country	Climate Change in PRSP(0-5)	Poverty-Climate link(0-5)	Climate Change Institutional Framework(0-5)	Total Scoring(0-5)	Country	Climate Change in PRSP/NAPA(0-5)	Poverty-Climate link(0-5)	Climate Change Institutional Framework(0-5)	Total Scoring(0-5)
Senegal	2	4	3	9	Senegal	3	4	4	11
Mauritania	1	4	0	5	Mauritania	3	4	4	11
Mali	2	4	3	9	Mali	3	4	4	11
Burkina-Faso	3	4	4	11	Burkina-Faso	3	4	4	11
Niger	0	4	0	4	Niger	3	4	4	11
Nigeria	3	4	3	10	Nigeria	0	0	0	0
Chad	2	4	2	8	Chad	4	4	3	11
Soudan	0	0	0	0	Soudan	4	4	4	12
Eritrea	0	0	0	0	Eritrea	4	4	3	11

## **Best Practices in Developing Countries on Mainstreaming Adaptation to Climate**

Burkina-Faso is the best Sahel countries which has put in place and implement PRSP and NAPA policies with including in including Climate change impact issues in PRSP.

The country use:

### **A multidisciplinary approach**

Using a panel of experts from various specialties to ensure the representative of various sectors in the selection, prioritization and ranking of projects and adaptation activities.

### **The participatory approach:**

The regional workshops information and conduct surveys in five regions representative of Burkina Faso whose selection took into account the selection criteria in a methodological workshop.

### **Complementary Approach:**

The preparation of the NAPA has considered plans, programs and policies national of Burkina Faso (see above).

Taking into account the gender aspect conducting interviews on the study areas took into account the strong involvement of young women and men. The composition of the team of experts also took into account gender aspect.

### **Profitability:**

The choice of priority actions and projects took account of implementation costs and impacts expected in the sectors and vulnerable groups.

### **Simplicity**

Given its multidisciplinary approach, the process has been simplified to make it effective and understanding by vulnerable communities.

Specifically, there are sometimes very close links between most of these tools National Planning and the NAPA. It may be noted among other linkages and complementarities following with some of these planning tools (Table 2)

From that method, the county has done a new Climate change risk management framework (See Table5)

Table5: old and new climate change adaptation strategy

Sector	domain	Current Climate Change adaptation Practices	Past climate change adaptation Practices
Water resource and sanitation	clean water facilities	Execution of modern wells; implementation of boreholes with TDC; establishment of piped water Supply drinking water to Large rural town	Traditional deepening wells; digging wells in the rivers beds;
		Implementation of individual and collective latrines; execution of sumps	excreta and waste water rejection on Street and house proximity
		Construction of modern wells, drilling Large flow ; dams; arrangements of ponds; diversion of watercourses; development irrigation perimeters and aquaculture;	Performing well gardeners; Drainage (pump and sprinklers)water streams, ponds and natural lakes
	wildlife and flora coverage of water needs	Creating a dam underground – test Adoption of IWRM as appropriate management style	Creation of artificial lakes for water wildlife
Agriculture		Anti-erosion bunds, Zai improved, half-moon strips grass; RNA; development grazing; SEF; hedge;	Zai, mulching, fallow;
	Agricultural input and cultural technical	Improved seeds, pits manure, composting, fertilizer chemical; use pesticides;	Seeds traditional short cycle ; Spreading organic manure;
	Operating System (diversification, adoption new techniques)	Diversification systems Operating (animal traction, irrigated, mechanized farming, CES-DRS techniques, etc..) Marketing productions	Crop intensification; intercropping production (rent, gardening) Abandonment of intensive crops water (yam, etc..)



Elevage	Pastoral resource management	Practice of shepherdess.	Transhumance towards areas with high potential pastoral (pasture, water)
		Stockpile fodder (crop residues, hay, straw)	Increased holdings of timber fodder
		Practicing Forage	Fight against bush fires to prevent the destruction of reserves of dry season forage
		Operations increased pastoral protected areas (forests classified, parks and reserves faunas)	Delineation and management pastoral areas
		Aggregation of large flocks of 2 or more herds means run in different agro-climatic areas	Increased herd size to couple with risks Climate
			Animals crowding in a herd transhumance and a core Dairy sedentary
		Supplementation of mineral-based animal or rock salt stone to lick in response to degradation of saline	Strategic complementation of animals kernel milk-based tor support SPAI fodder deficit in times (end of dry season, drought)Using blocks multi-nutritional to overcome lack of quality forage
		Conversion of shepherds to milk collector, etc.	Creation of mini-dairy
		Practice of fattening of animals by farmers Conversion to other activities	Practice of agro-pastoral farming with a commitment of pastors and the acquisition of livestock by farmers

4. Forestry and Biodiversity			Shepherd, collecting milk, etc..)
	Forestry	Assisted regeneration	Enclosure
		Reforestation using native species	Fight against bush fires and uncontrolled cutting of wood
		Plantation of medicinal species	Firewood marketing and harvest yields
		Delineation and monitoring of village forests	Increased exploitation of non-timber forest products (NWFP)
	Breeding	Creation of village areas of interest Hunting(ZOVIC)	Livestock unconventional
	Fishing	Spatial boundaries of aquaculture (fish, ...)	poisoning of some rivers
	Energy	Using new equipment valuing energy wood (homes improved) Salvage logging cleared of major works	Using equipment to alternative energy (pressure cookers, pot bora) and especially for devices using solar energy (water heaters, dryers, stove -oven, lighting, etc..)
Using equipment to alternative energy (pressure cookers, pot bora) and especially for devices using solar energy (water heaters, driers,)		Using new equipment valuing energy wood (improved stoves) Salvage logging cleared	

In 2003, 46.4% of the population lives below the poverty line against 44.5% in 1994 (AGRECO, 2006). Poverty is mainly rural phenomenon, and 52.3% of the rural population lives below the poverty line against 19.9% in urban areas (AGRECO, 2006). The impact of urban poverty evolution shows a trend towards pauperization of urban populations since the impact increased from 10.4% in 1994 to 19.9% in 2003 (AGRECO, 2006) .

Despite economic growth and sector results obtained, the climate risk management programs elaborate such as the NAPA, the PSRD, etc. ...several survey conducted in 2003 shows that the impact of policies pursued had not yet resulted in a shift in the poverty impact in Burkina Faso, which remains above 45%. The most recent analysis, as the report of the World Bank on poverty assessment and the study by researchers at the University of Gottingen in Germany, however, show a lower

incidence of poverty .This therefore limits the objectives and the difficulty of carrying out those programs and strategic.

### **Potential obstacles to NAPA implement**

It should be noted that the implementation of the above program proposed and achieving objectives assigned to it may be hampered by a number of factors more or less controllable:

- At the program, it is the degree of actual participation all stakeholders;
- The slow pace of administrative and accounting procedures with the result non-completion time of sub-programs or activities;
- Funding for the program and making available timely resources by the financial lender;
- Natural disasters such as floods or droughts exceptional;
- Lack of biophysical data that can feed the simulation models;
- Lack of qualified human resources; and
- Difficulty of coordination, involvement of the grassroots.
- Financial resources mobilization and lack of good public finance management.

## **VI- Conclusion and Policies**

Nowadays it is clear that there is relation between climate and poverty rate. Hence climate change adaptation strategies have become major issues in all vulnerable countries as non-vulnerable countries. In the Sahel regions one of the region where poverty rate is about more than 50% of the population live under \$ 1USD per day (World Bank, 1996) and one most vulnerable regions face climate change risk has put in place several strategic as well by own-farmers, NGOs ,central governments policies to achieve both climate change risk management and poverty reduction rate, farmers traditional climate change adaptation methods and NAPA.

Managing hazard risks establishes mechanisms and creates capacities for future climate risk management by integrating hazard management strategies in development a crossover benefits in building national and local adaptive capacities for long term climate change and variability. The World Bank has been moving from post-disaster reconstruction to pre-disaster mitigation and preparedness as a critical dimension of its poverty agenda (World Bank 2006). There are clear elements of hazard risk management in some of the countries PRSPs, but emphasis tends to be on early warning and post disaster response rather preventive and mitigation strategies. It is important to continue the mainstreaming hazard management as a first phase and incentive an evolution to mainstream adaptation to climate change in PRSP.

Most countries that experience frequent natural hazards, as in the case of Burkina-Faso, have more experience to integrate climate change adaptation into

national policies. But since 1994 Burkina Faso has start to implement the NAPA, household living conditions especially poor household did not know much change. But Nonetheless, several factors such as difficulties of farmers to understand how to implement the policies, low household involvement in the program and lack of technology for actualize the data.

The ability to handle current climate variability is a vital and prime, if not a sufficient, requirement for managing a future changed climate; handling current climate variability further is directly achievable and provides immediate production and capacity benefits.

Understanding how to manage the consequences of climate variability in the context of the many other influences on social, economic, and natural systems will clearly provide useful experience when considering strategies for handling future climate change (Washington 2006).

Most of the countries assessed in the report, low-income countries, have a clear dependency on agriculture, a weather-sensitive resource and limited economical resources. Yet evidence from traditional societies demonstrates that the capacity to adapt in many senses depends more on experience, knowledge and dependency on weather sensitive resources. Uncertainties in adaptive capacity are profound.

Recognition of the nature of this uncertainty, portrayed through a traceable theoretical account, is an essential starting point for use of information for decision-making in this area (Adger 2005). One important question is why most of the countries have not incorporate adaptation into their PRSPs and planning. For countries in Africa climate is often seen at the national level as a lesser priority compared to other spending needs, and the case for higher investment has not been accepted in all countries (Washington 2006).

The low and diverse degree of incorporation of adaptation to climate change in the assessed countries in the report suggests the following recommendations:

- The World Bank and the UNFCCC should coordinate their effort in supporting those countries that have an interest in mainstreaming adaptation to climate change into their PRSP.
- The World Bank and the UNFCCC should coordinate to further support the development of NAPAs in the rest of the low-income countries.
- Special attention should be given to concerns about the NAPAs financial problems to meet the needs of every country for carrying out sufficient public consultations.
- Research should look at quantifying the contribution of climate variability to the achievements of the MDGs. According to Washington et. al no attempt has been

made to quantify the actual contribution that climate variability makes to the achievement of the MDGs (Washington 2006).

- The UNDP, UNFCCC and the World Bank should enhance financial support and advise on the integration of national inter-ministerial climate change commissions.

It is important to enhance cross-sectoral flow of information and coordination to address adaptation to climate change.

- Countries should developed regional and local climate change institutional frameworks to strength the coordination, networking and information flows with different levels of governments and local civil society to have better response to poverty eradication and climate change.

- Investment on regional climate change modeling is important in order to reduce uncertainties and help to advise in the decision-making process.

- Country should apart donor funding should invest a part of they annual GDP in climate change risk management issues. Government should not rely on donor funding but also plan own financial resources mobilization plan.

- Sahel countries should plan a sustainable climate change risk management by implementing win-win (environmental and poverty) project types in link with CDM.

But win-win projects in the CDM will not be easy. Firstly it is not clear how much demand there will be for CDM projects; with the US opting out of the KP and the threat of Russian hot air sales, the price of carbon could prove too low for many pro-poor options. Secondly, the CDM is essentially a market-based mechanism and left to market forces CDM investment would focus on large ‘carbon-rich’ developing countries and transition economies. Most economic models predict China, India and Brazil gaining the lion’s share of CDM projects (McGuigan et al, 2002). A third problem is the higher transaction costs of pro-poor projects due to organizational and administrative factors. Even if transaction costs can be lowered, CER purchasers still face large upfront costs, long payback periods, and relatively high risks

#### **Box 4: Potential win-win CDM projects**

Small-scale rural renewable energy projects appear to offer the best prospect for poverty benefits in the CDM. According to a recent DFID research study (Troni et al, 2002), poverty benefits will be highest where rural households are connected with new energy sources, for example, via grid-connected biomass electricity production. The poverty benefits from this type of project can include increased income from enterprise development, access to clean water, improved health services and sanitation, security, education and gender benefits (as women and children spend less time collecting firewood and water). Improved wood stoves and micro-hydro power generation are other energy options with high poverty benefits. But the study observes the need for ‘dedicated purchasing programmes’ to ensure such benefits are obtained.

Another high potential area, according to a recent study by the Center for International Forestry Research (Smith and Scherr, 2002), is community-level forestry, in spite of the fact that forestry ‘sink’ activities in the first phase of the CDM have been limited to afforestation and reforestation. There is scope for community based restoration of degraded and deforested areas through multiple-species reforestation and agroforestry.

But such projects will have higher transaction costs and lower biomass productivity compared to industrial plantations. There are also outstanding uncertainties over forest definitions and sink project modalities.

It is becoming clear that developing countries, which are responsible for ensuring CDM projects meet national SD criteria, will require considerable ODA support as well as domestic political will to priorities and secure win-win projects – competition for scarce CDM funds means there is an obvious temptation to trade-off SD objectives (McGuigan et al, 2002). Developing countries therefore need support to:

- ✓ Develop a legal and policy framework for the CDM;
- ✓ Develop institutional capacity for identifying, designing and vetting pro-poor CDM projects; this includes an effective set of SD criteria, social and environmental impact assessments, and economic carbon analysis;
- ✓ Lower the transaction costs of SD-oriented CDM projects, for example by ‘bundling’ projects, supporting new or existing institutional arrangements for rural communities, and introducing simplified and standardized procedures for project appraisal, monitoring and reporting carbon performance, while at the same time ensuring local participation in project design and transparent decision-making;
- ✓ Introduce risk mitigation mechanisms which increase the attractiveness for CER purchasers;
- ✓ Secure property rights for land or forest use projects;
- ✓ Develop supportive learning networks.

### **Potential solutions and priorities**

The priorities for equitable and poverty-reducing climate change actions can arguably be divided into three main areas: mitigation (including the CDM); adaptive capacity building, including the mainstreaming of climate change actions in development policies; and disaster relief.

### **Equitable mitigation and the CDM**

From the perspectives of both equity and environmental effectiveness, and therefore global security, the best solution would be one based on per capita emission rights. One of the best-known per capita emission rights proposals is Contraction and Convergence (C & C) (Box 5).

•Policies also should be address for farmers own risk management by focusing on

traditional knowledge developed locally in each region such integrates the issue of climate change adaptation into policies and development frameworks. Developed in Sahel countries mainstreaming adaptation to climate change projects in the agricultural development and biodiversity at local, national and regional levels.

Farmers, scientists and policymakers must work together to develop a sustainable use of biological resources in SAP, SIM warning system for pasture; Surveillance System crickets and other pests. Focusing on traditional knowledge developed locally in each region.

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