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Introduction: Environment, employment and vulnerability

Climate change, whatever its causes and precise timelines, represents one of the most challenging threats to sustainable development for all those living in Africa. The continent is home to the most susceptible populations of the world, because of the sensitivity and fragility of its natural environment, and its high dependence on environment-based livelihoods, such as agriculture. Over the past ten years, the African Development Bank's annual Gender, Poverty, and Environment Indicators in African Countries report has highlighted women's heavy reliance on environment-related livelihoods. This includes women's predominance in subsistence agriculture and their contribution to the production of economic crops, agriculture-linked market and retail trade, and nature tourism.

Of all global regions, Africa is the least responsible for contributing to climate change; however, its populations are most at risk from its damaging consequences. An estimated 70 percent of Sub-Saharan Afri-

cans rely on subsistence rain-fed agriculture (Hellmuth et al. 2007). In 2010, some 57 percent of African peoples lived in countries where more than half of the workforce was engaged in agriculture. Moreover, in 46 of Africa's 53 countries, women represent 40 percent or more of the agricultural workforce. Agricultural work is characterized as vulnerable because generally it does not comprise formal-sector jobs with contracts and income security. In Africa, women are more likely than men to work in vulnerable employment – either as own-account workers or as contributing family workers – and therefore are subject to low earnings and productivity. As Figure 1 shows, more than 84 percent of women in Sub-Saharan Africa, compared with 71 percent of men, are engaged in such jobs (UN DESA, 2010). Compared with other regions of the world, they are among the most unprotected of workforces. In North Africa, even though informal or self-employment is less predominant, the gender gap is stark, with almost twice as many women than men working in the vulnerable informal and self-employed sector.

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The findings of this brief reflect opinions of the authors and not those of the African Development Bank, its Board of Directors or the countries they represent.

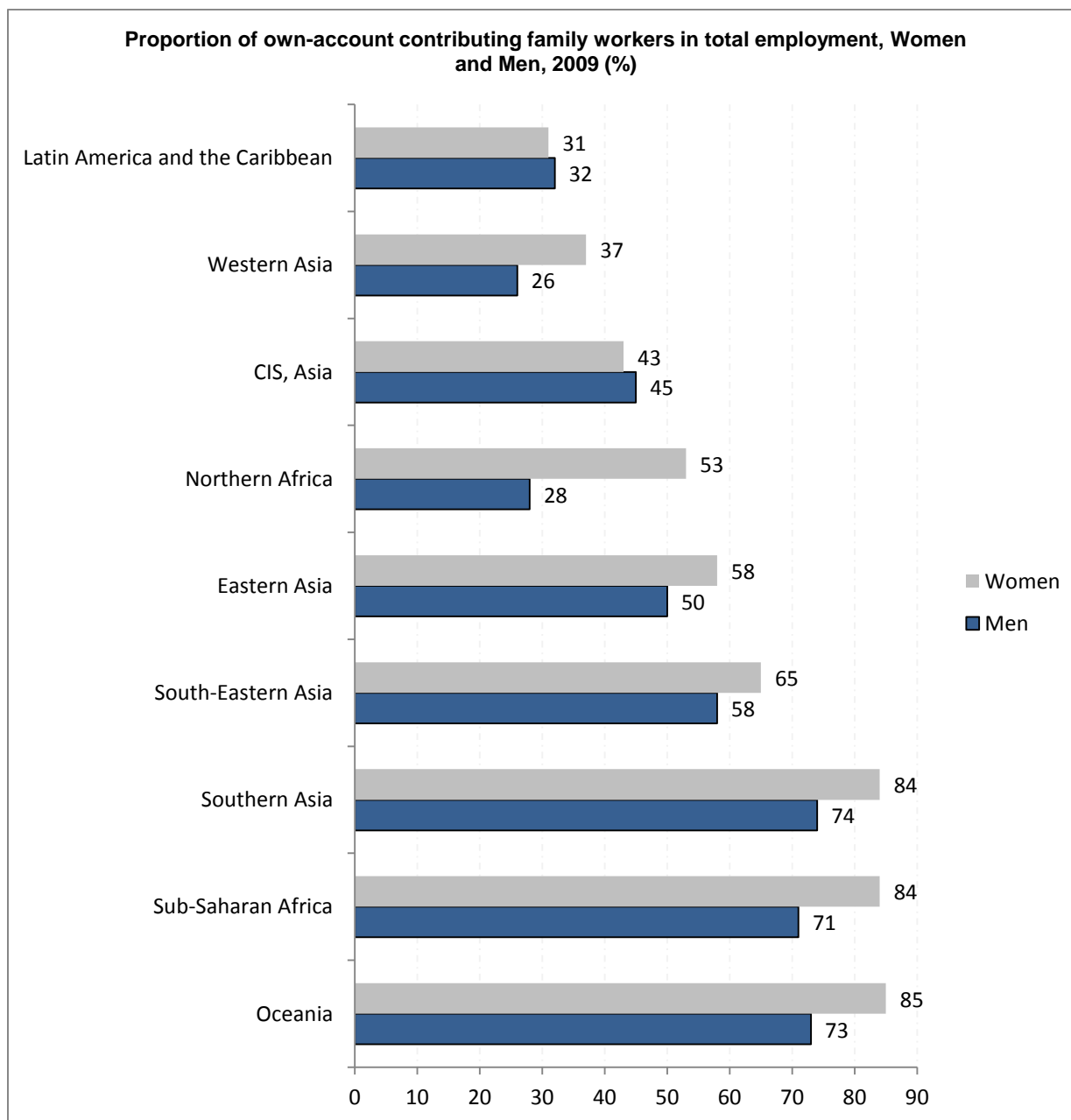
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Figure 1. Women and men in vulnerable employment, global comparisons¹



Source: UN-DESA 2010.

¹ Vulnerable employment includes those jobs characterized by the national statistical surveys as “unpaid” or “contributing” family workers, or self-employed.

In Africa, we are therefore looking at a population that is already at greater risk of livelihood insecurity. In this context, the human threats inherent in climate change are crucial, and may be more serious for women in certain occupations and regions. As the African Development Bank (AfDB) makes clear:

The impact of climate change is experienced differently by regions, generations, age groups and sexes... Climate change has specific effects on women and men because of the different roles they play in society and their differentiated access to social, economic and physical resources. In Africa, these disparities resulting from the social positions of women within the family and the community are aggravated by the effects of climate change on the very factors that are most essential for protecting women's means of subsistence (food, water and energy supply).

(African Development Bank, 2009d, p. 1)

The roles of women and girls in terms of household tasks are also likely to be more severely impacted by changes in climate:

Climate change could alter the tasks people perform and their time use, affecting men and women differently. For example, rural women, and girls to some extent, frequently provide households with water and fuel wood for heating and cooking. The time needed for their work in gathering water and fuel will likely increase with water shortages and the depletion of forests. Decreasing the time available to women for food production and preparation as well as participation in income-generating activities will likely affect

household food security and nutritional well-being.

(African Development Bank, 2009d, p. 15)

In recent years, expert reviews have begun to recognize that efforts to mitigate climate change, despite mounting evidence of their importance, are not proceeding quickly enough to halt its damaging impact on human activities and health. This is reflected by coverage in prominent media, and by lowered expectations in international statements. Senior UN officials have explicitly voiced the threat that this poses to attainment of the Millennium Development Goals (MDGs), particularly those related to poverty, children's health, and girls' schooling. The worrying conclusion is that, "given the scale and momentum of climate change, it is already too late to fully stop it." They are therefore calling for more urgent action to slow the pace, and to improve sustainable development practices (Sha Zukang, 2008).

"Global action is not going to stop climate change," stated one eminent journal, "the world needs to look harder at how to live with it." The feature article, entitled, "How to Live with Climate change: Facing the Consequences", warned that much of the world must find ways to live with scarcer water supplies, higher peak temperatures, higher sea levels, and more extreme weather patterns, including drought and floods (*The Economist*, 2010). If mitigation is unlikely to produce results – or not soon enough for people in need today – then the challenge for populations and policymakers alike is to find better ways of adapting to the changes that are coming, and to many that are here already. This means action on many fronts, to reduce the vulnerability of communities and people, including:

strengthened flood prevention measures, early warning systems and sound building codes... planting mangrove trees on exposed coastlines, or drought-resistant crops in dry areas... educating children and communities about disaster preparedness and risk reduction... integrating scientific and indigenous knowledge into decision-making.

(Sha Zukang, 2008)

What do such measures and consequences mean for women in particular? Adapting to environmental realities and change has always been the hallmark of women's roles in family and community survival. As the impact of climate change comes under study in vulnerable communities and regions, we see evidence of women's leadership in coping with changing circumstances. Women seem practiced, researchers note, in "exploring opportunities that enable them to cope better [than men]. Women are also repositories of knowledge about crops and climate, the environment, natural resources, food preservation techniques, etc. ... and are seen to be such by men" (Petrie, 2011). Environmental adaptation, whether this means confronting greater pressures on water resources, rising sea levels or declining biodiversity, has special relevance for women. This relates to their roles in provisioning homes and farms in water and fuels, and on their reliance on vagaries of the weather to support subsistence food production.

This article focuses on policy to support adaptation to climate change, and the importance of good gender analysis in planning and following through. It first examines how vulnerabilities are understood by climate change specialists. Then it examines how, through these perspectives, African people – particularly women in environment-based livelihoods – can best be supported by governments and development

partners to adapt to the effects of climate change.

In looking at vulnerability, the article draws attention to women's special relationship to environmental livelihoods, their responsibilities toward their families, and their role in safeguarding community survival. It focuses on women's particular capacities developed in these roles, and posits the need to take account not only of the risks, but also the opportunities that adaptation to climate change presents.

For many observers, one difficulty has often been how to locate data for policy and advocacy. One thread running throughout this article is the vital role that reliable and timely data can play in supporting policymaking. In each section we shed light on the kinds of data that are required, and the routes that need to be taken to ensure that data are compiled and made available. We advocate the use of standard tools and instruments that are already available to African institutions, rather than initiating new methods of data collection. One objective is to safeguard good practices in the gender sensitivity of survey instruments and methodology. Equally important, the article assesses how best to ensure that robust data are made available for policymakers and advocates for gender equality and women's empowerment.

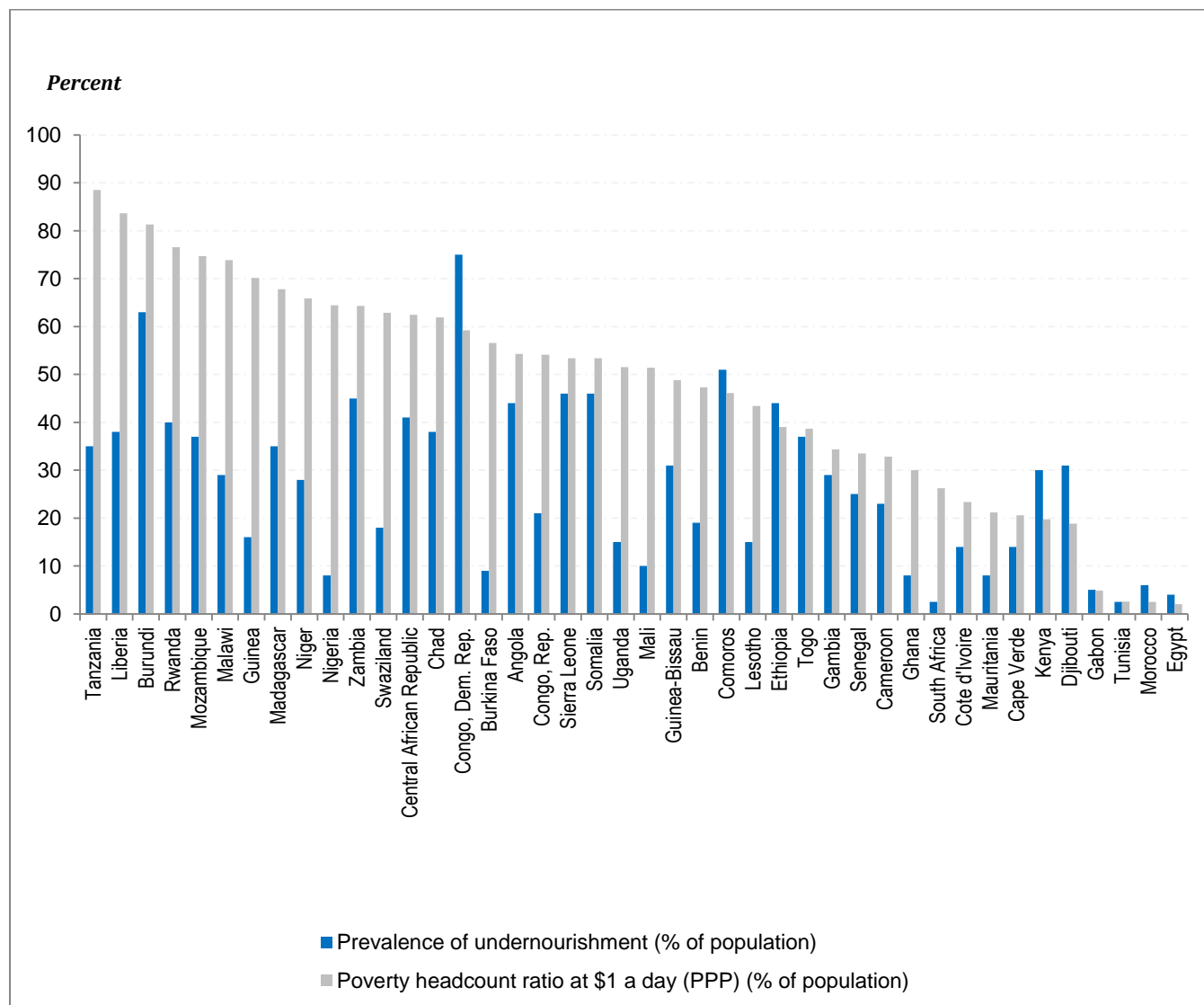
2. Linkages between Agriculture, Poverty, and Under-nourishment

The previous section highlighted the importance of agricultural and environment-based livelihoods to Africa's economic development, and in particular the major role that women play in that sector. The low productivity of the agricultural sector in the

continent has translated into low incomes for agricultural workers, and this has left a large swathe of the population in poverty. Figure 2a illustrates poverty rates for African

countries (for those living on less than US\$ 1 per day), combined with prevalence rates of undernourishment.

Figure 2a: Poverty rates and undernourishment prevalence for selected countries²

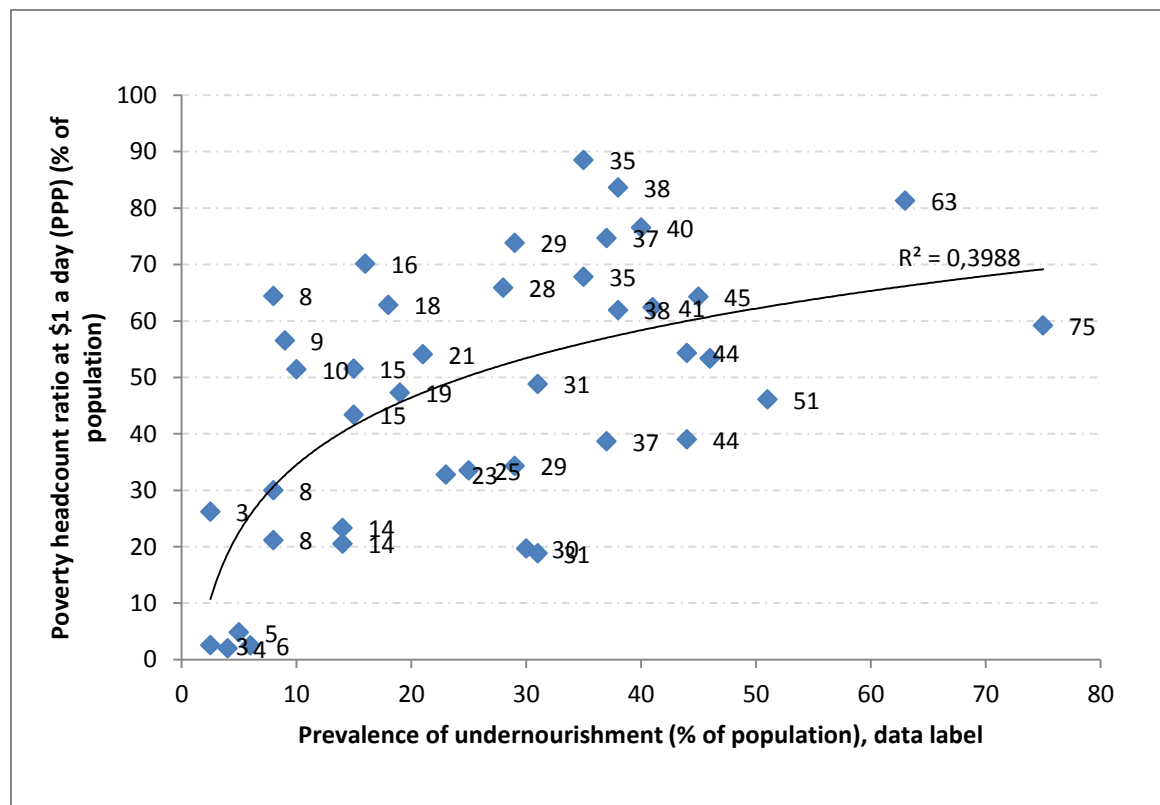


Source: AfDB Data Portal.

² All data, unless otherwise noted, are authors' calculations taken from the AfDB Data Portal – see Annex 1.

Figure 2b shows the same data series as a scatter plot. While some correlation is evident between poverty and undernourishment, there is an important variation among countries.

Figure 2b. Poverty rates, undernourishment, selected countries



Source: AfDB Data Portal.

A counter-intuitive finding of these figures is that some countries with high poverty ratios are nonetheless able to assure better nutritional levels (e.g. Tanzania, Liberia, Rwanda), while other countries, despite having higher per capita income levels, suffer grave undernourishment rates (e.g. Democratic Republic of Congo, Comoros). This disconnect may be related, on the positive outcome side, to income being better directed to nutrition – which is more likely to occur when women receive income directly into their own hands. From the negative impact perspective, it may stem from disruptions or conflicts, which prevent cash incomes from reaching households. A

significant amount of country research over several decades has shown, for example, that “households in which women have more resources often spend more on household and child nutrition – diet quantity and quality – than do male-dominated households” (Fan and Brzeska, 2011).

The aggregate data do not in themselves provide the explanation for these differences in outcomes, and sex-disaggregated data are not available. Another gap in the AfDB Data Portal relates the anaemia rates among women and during pregnancy, which are also not reported through country surveys. However, the standard country surveys conducted by national statistical offices (NSOs) could provide greater insights, if

data were made available to interested researchers in health, gender, and other networks. With the use of country data, researchers could link nutritional levels to women's education levels, economic and care activities, and community services, for example. This could then help to inform strategic policymaking at the government level and highlight those areas that would benefit the most from increased attention.

3. Human Vulnerability to Environmental Risk: Women's Burden

Vulnerability of the natural environment is generally defined as the ability of the land to cope with and respond to hazard. Human vulnerability (to environmental hazard) refers to people's exposure to risks, coupled with their capacity to anticipate and respond, whether by adapting to their setting, or by moving to less affected areas. When livelihoods are highly dependent on the environment, vulnerability is potentially higher – and it is evident that poor people are more reliant on the environment for their survival. More specifically, women have much to lose, since not only their livelihoods, but also their responsibility for the survival and health of their children, are linked to their natural surroundings. As this article highlights, African women shoulder an enormous but imprecisely recorded portion of the responsibility for subsistence agriculture, the culling of resources for subsistence and marketing, the provisioning of households in fuel and water, and much of the share of agribusiness and various economic crops.

While early work on climate change focused on the *biophysical vulnerability* of the natural environment to risk exposure, the human impact of environmental risk has been described in terms of *social vulnerability*. The latter term can be

understood as the complex interrelationship between social, economic, political, technological, and institutional factors that render a country or community more or less vulnerable or resilient in the face of a hazard (Vincent, 2004, p. 3). Vulnerability is measured in light of people's capacity to understand, manage, and mitigate impacts. For such analysis to be meaningful, it must show how the quality of life and burden of time expended are modified by the impacts in question.

It is apparent that measures of vulnerability depend on the focus of concern, whether this be the natural environment, the economy, poverty and development issues, or other dimensions. The Intergovernmental Panel on Climate Change (IPCC) has provided encyclopedic assessments of “potential key vulnerabilities” of several kinds, framed by a methodology linking all of these to various temperature change scenarios. A recent report (Parry et al., 2007) assesses: the risk to global social systems (food supply, infrastructure, market systems, health impacts, migration and conflict settings, and vital water resources); the risk to global biological systems; specific regional concerns; and risks of extreme environmental events. To translate such risks into human development terms, we need to assess the specific and differential ways in which they affect women and men within these systems.

The 2007 IPCC report states:

Africa is likely to be the continent most vulnerable to climate change. Among the risks the continent faces are reductions in food security and agricultural productivity, particularly regarding subsistence agriculture, increased water stress and, as a result of these and the potential for increased

exposure to disease and other health risks, increased risks to human health.

(Parry et al., 2007)

The IPCC's attention is directed to physical, economic, as well as social and strategic vulnerabilities. The focus of our article though is on the different roles that women and men play in ensuring food security and agricultural production in Africa. For this, we need to have robust data to cover the gender structure of subsistence agriculture and changes in this sector. We also need to be able to report, from one survey year to the next, what changes have taken place to augment "water stress"³ for women responsible for gathering water. This is crucial as their children's survival depends on their ability to provide clean water for them. Furthermore, we need data to continuously report on disease burdens, particularly those affecting mothers, pregnant women, children, and those most at risk – because this is the human development meaning of "increased risks to human health." As we note below, such data need to be collected at the level of country surveys by the national statistical systems (NSSs) of each state.

Like a metaphor for their land, African women stand on the frontline confronting the challenges that climate change poses to their livelihoods and the health of their families. Yet, they are poorly equipped to slow change, and poorly resourced for the adaptations demanded of them. There is an overwhelming consensus among the

³ Water stress is defined by the UNEP's *Global Environment Outlook* as areas where water consumption is more than 10 percent of renewable freshwater resources. The GEO-3 scientists project that more than half the people in the world could be living in severely water-stressed areas by 2032. See section 5 of this article for more discussion on water stress and its impact on women in particular.

international development community that African women are already severely affected by climate change and will come under greater strains year by year, should current trends continue. Africa's vulnerability derives from multiple stressors linked to agricultural sensitivity to changing climate patterns. This factor, coupled with low adaptive capacity in the given cultural and technological settings, renders the condition of women highly precarious. Women's ability to successfully adapt to the changing environment will prove vital to their quality of life and development, to that of their families, and to the survival of their communities.

The Tyndall Centre for Climate Change Research⁴ provides an index for African countries' social vulnerability to climate-induced changes (Vincent, 2004). The index includes factors such as natural resource dependency, economic stability and infrastructure, and demographic dimensions.⁵ The overall Social Vulnerability Index has identified Niger, Sierra Leone, Burundi, Madagascar, Burkina Faso, and Uganda as the six most vulnerable countries in Africa, while it found Djibouti, Mauritius, Algeria, Tunisia, South Africa, and Libya to be the least vulnerable. When the index is decomposed to its sub-elements, the order of vulnerabilities changes; for

⁴ The Tyndall Centre is a UK-based research organization which aims to research, assess, and communicate from a distinct transdisciplinary perspective, the options to mitigate, and the necessities to adapt to, climate change, and to integrate these into the global, UK, and local contexts of sustainable development.

⁵ The Tyndall Social Vulnerability Index is a weighted average of a number of composite elements, including economic well-being and stability (20%), demographic structure (20%), institutional stability and strength of public infrastructure (40%), global interconnectivity (10%), and dependence on natural resources (10%).

example, focusing solely on “natural resource dependency” (rather than other social and economic factors), the six most vulnerable countries to emerge are, in order of vulnerability: Rwanda, Burundi, Uganda, Ethiopia, Burkina Faso, and Eritrea (Vincent 2004, pp. 31, 44).

The ten countries ranked most vulnerable to climate change by the composite Social Vulnerability Index are presented in Figure 3, together with three sub-indices focusing on individual risk factors. This reveals that ten countries appear on more than one index (Burkina Faso, Burundi, Chad, Ethiopia,

Madagascar, Mauritania, Niger, Sierra Leone, Tanzania, and Uganda) – indicating a high degree of vulnerability from multiple sources. In addition, looking at the situation of women in these highly vulnerable countries, we find important linkages to agricultural activities. The figure also presents (in parentheses) the percentage of women that make up each country’s agricultural workforce. In almost all of the countries ranked in the top ten by various measures, women constitute 40 percent or more of the agricultural labor force, as measured by formal surveys.

Table 1. Ten African countries most vulnerable to climate change, by various indices (with women’s share in agriculture)

	Social Vulnerability (overall) Index	Natural Resource Dependency Index	Economic Wellbeing and Stability Index	Institutional Strength and Public Infrastructure Index
(1 = highest)	(Women’s share of agricultural workforce, %)			
1	Niger (37%)	Rwanda (57%)	Zambia (47%)	Burundi (56%)
2	Sierra Leone (62%)	Burundi (56%)	Madagascar (54%)	Nigeria (40%)
3	Burundi (56%)	Uganda (50%)	Sierra Leone (62%)	Sierra Leone (62%)
4	Madagascar (54%)	Ethiopia (46%)	Mauritania (54%)	Cameroon (47%)
5	Burkina Faso (48%)	Burkina Faso (48%)	Gambia (53%)	Madagascar (54%)
6	Uganda (50%)	Eritrea (44%)	Chad (57%)	Niger (37%)
7	Ethiopia (46%)	Niger (37%)	Niger (37%)	Côte d’Ivoire (36%)
8	Mauritania (54%)	Guinea-Bissau (45%)	Gabon (46%)	Ethiopia (46%)
9	Lesotho (67%)	Chad (57%)	Cape Verde (42%)	Tanzania (55%)
10	Tanzania (55%)	Malawi (59%)	Botswana (57%)	Togo (41%)

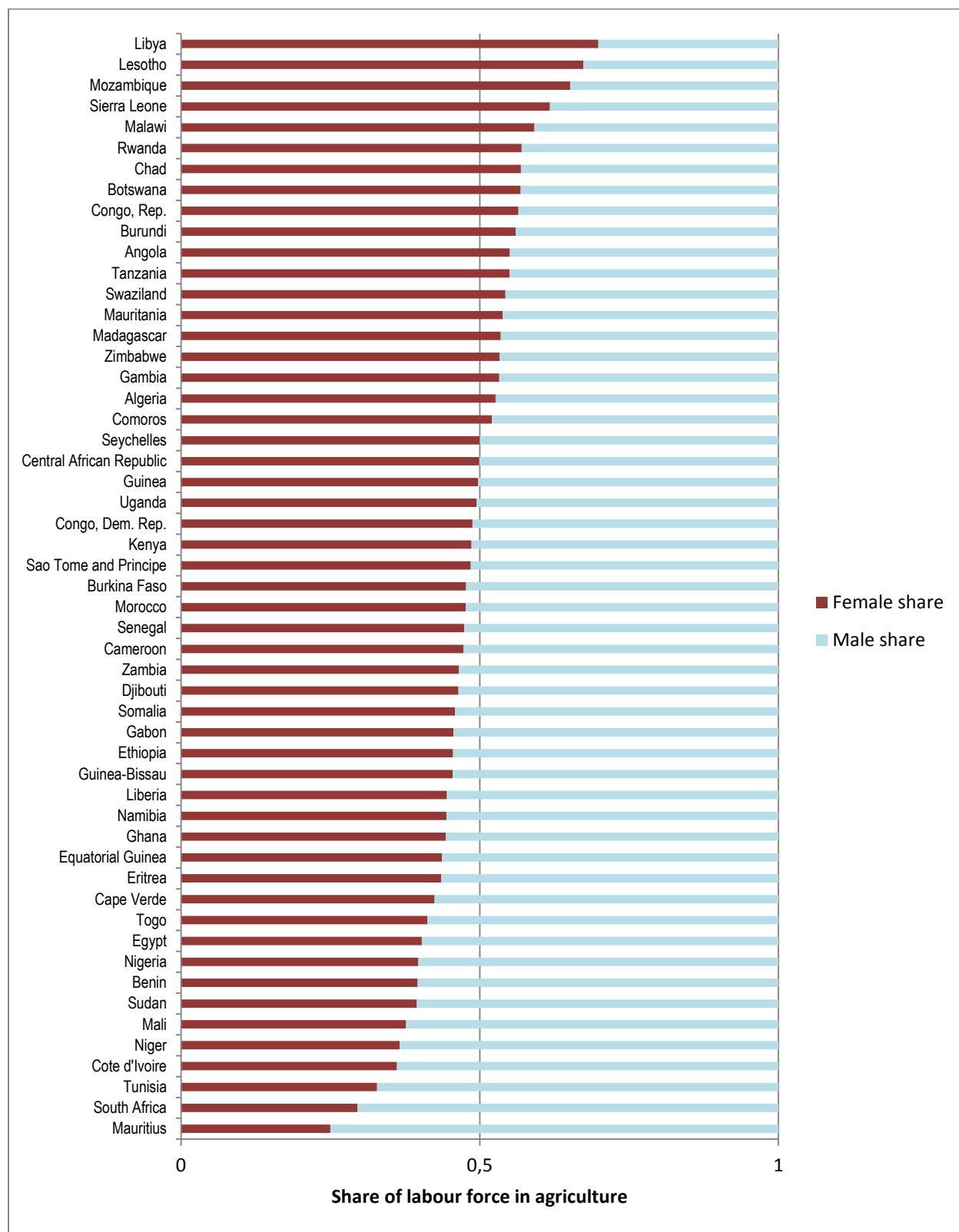
Source: Vincent 2004; authors’ calculations.

4. Women's Contribution to Agriculture and Data Collection Constraints

Since reliance on resource-based livelihoods is a major factor in climate change vulnerability, it is worth looking more closely at the role of women in agriculture, as evidenced in the country data. Figure 3 reveals that in 46 of Africa's 53 countries, women represent 40 percent or more of the

agricultural workforce, while in 23 countries, their share rises to 50 percent or more. (Detailed data for all charts and references are given in Annex 1.) The 46 countries where women formally shoulder 40 percent or more of the agricultural workload represent the vast majority of the population (85 percent of the continent's total population of 1.03 billion people in 2010).

Figure 3. Share of agricultural workforce, by gender



Source: AfDB Data Portal (see Annex 1).

Research shows that in much of Africa, women are generally the main producers of food crops, such as maize, rice, cassava, and other tubers. Men are more likely to engage in commercial farming and the production of cocoa, cotton, and coffee for export. However, there are several cases (e.g. in Burkina Faso, Tanzania, and Zambia) where male and female farmers jointly grow food and commercial crops. Men may move into activities that are considered more female-based if these become more productive or profitable (as has happened in Gambia, Tanzania, Uganda, and Zambia). Women are also engaged in nontraditional agricultural exports in Kenya, South Africa, Uganda, and Zimbabwe, where production tends to be female-dominated. Their employment is more likely to be precarious, characterized by short-term, seasonal, and casual work (FAO, 2010, p. 13).

It is probable that many countries' reliance on female labor is greater than indicated by the formal data, for several reasons. Data on women's labor force participation are difficult to compare across countries, because of differences in methodology, among other things (see Box 1). To cite one example, the female share of agricultural production in Rwanda, recorded as 57 percent in Figure 3, was observed by researchers in field studies to be nearer 70 percent. Similarly in Kenya, women's share was observed to be 75–89 percent, compared to 49 percent given in Figure 3.⁶

Researchers at the Food and Agriculture Organization (FAO) state unequivocally that, “women are the mainstay of agricultural sectors, the farm labor force and food systems (and day-to-day family

subsistence)” (Viatte et al., 2009, p. 69). Gaps in observations by agricultural specialists and in official household surveys are not uncommon. It is likely that in many countries, the household survey underreports the labor force participation rates of women because of the way the questionnaires are designed. For example, in many living standards measurement surveys and labor force surveys, the questionnaire uses terms such as *job* or *work* – which are words that would not generally be used by poor women themselves to describe their daily lives. A review of official questionnaires shows that questions such as “What is your job?” or “In the past 7 days, did you work (on a farm, factory, or on your own account...)?” are more common than more probing questions that ask about economic activities familiar to local women and men.

Researchers in anthropology and social studies acknowledge that subsistence farm work, vegetable gardening, and livestock care are commonly not recognized as a “job” or “work” by African women. A great number of rural women self-report as “housewives,” “helpers,” or other terms that minimize their role as producers (see, for example, “farmer-housewives” in Potts, 2000). However, for survey enumerators, such terms do not fall under the category of “economically active,” and so these women are officially recorded as “housewives” in the survey.

Further, the provisioning of fuel and water, which is deemed an economic activity by the UN standard System of National Accounts (SNA), is excluded by NSOs. A World Bank publication has noted,

Although not consistently implemented by statistical agencies at the national level, since 1993 activities such as water

⁶ For data on Rwanda, see African Development Bank (2008), p. 21. For data on Kenya, see Ahearn and Tempelman (2010), p. 2.

fetching and firewood collection are counted in principle as part of SNA work. Inclusion of these activities in the SNA is important, not only because it is one way to make visible a category of work for which women are primarily responsible, but also because, as the time use data show, this represents a very substantial time and energy allocation on the part of women.

(Blackden and Wodon, 2006, p. 19)⁷

While a number of countries, notably in West Africa, have included some part of non-market production and provisioning activities in their surveys, most have not. Inclusion of such data would likely alter the overall numbers for women's participation in economic activity, particularly in agriculture. This undercounting arises also from other difficulties within NSS survey practices, including the prevalence of multiple or parallel jobs held by women; their involvement in informal work; and the interweaving of women's agriculture, processing and trade work with domestic services (see Box 1).

Box 1: Underestimating women's work

“[T]here are several reasons for the underestimation of women's contribution, due to the limits of the current concepts and methods of data collection. A first reason is that women, more than men, are involved in multiple jobs. The measurement of pluri-activity is still a major challenge for survey statisticians. A better estimate of women's contribution to GDP is

⁷ The extract continues: “It is usually not very well known that such female time-consuming activities as firewood and water fetching fall within the boundaries of measured production. Ever since the SNA 1968, such activities are included, being considered as extractive activities and the National Accounts in various West African countries include them in their GDP calculations (for instance Burkina Faso)” (Blackden and Wodon, 2006).

obtained in the countries where efforts have been made to measure their secondary activities (multiple jobs). Burkina Faso is a typical example of a country where the informal sector is principally urban, tertiary, and male as far as the main activities are taken into account, and becomes principally rural, manufacturing, and female, when multiple jobs are taken into account. Rural women are engaged in secondary activities, which mainly consist in the processing of agricultural products and food products.

A second reason results from the first one: statistical surveys generally fail to measure these female manufacturing activities that are hidden behind agricultural, primary, or trade activities. The bulk of the female labor force, especially in the informal sector, is in agriculture and in trade. Trade is very often the last stage of diversified female activities, starting with growing agricultural products or collecting natural products, processing them (food products, mats and baskets, textiles, and so forth) and finally selling them. Where only this last stage (trade) is captured, or the first one (agriculture or gathering), then the value added of female activities is often underestimated. Moreover where these processing activities lead into domestic activities (for example, winnowing and crushing cereals for the preparation of meals), they often remain unmeasured.”

(Source: Blackden and Wodon, 2006, pp. 43-44)

While rural women and men may play complementary roles in farming activities, agriculturalists observe that women tend to play a greater role in natural resource management and ensuring nutrition in the household. In Africa, women often grow, process, manage, and market food and other natural resources. They are responsible for raising small livestock, managing vegetable gardens and, as already noted, provisioning in fuel and water. It is estimated that in Sub-Saharan Africa, women are responsible for 80 percent of food production. Men, by contrast, are generally engaged in cash

cropping and large-livestock husbandry. As Figure 3 illustrates, women's predominant role in farming is most common in regions that are most vulnerable to the impacts of climate change, particularly Sub-Saharan Africa. In this context, responsibility for adaptation is likely to fall on their shoulders – including finding alternative ways to feed and provide water for their families (Brody et al., 2008, p. 4).

5. Increased Water Stress: the Impact on Women and their Families

The IPCC forecasts that by 2020, between 75 and 250 million people in Africa will be exposed to increased water stress due to climate change. By 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50 percent. It is projected that agricultural production will be severely compromised in many African countries, leading to food shortages and malnutrition. By 2080, an increase of 5-8 percent of arid and semi-arid land in Africa is projected under a range of climate scenarios (IPCC 2007, § 9.4).

Applying these forecasts to women's lives and time-use, researchers have considered the vast amount of time women spend at present in provisioning households and farms with fuel and water:

It would be hard to imagine a family in the developed world today spending one or more hours every day gathering biomass such as wood, agricultural residues, and dung, when they could instead buy cooking fuel for the same purpose at a price that reflects income from five or fewer minutes of work. Yet this is the burden of women in the developing world. The disproportionate amount of daily time and effort women and young girls spend gathering solid fuels and water for household chores could be used for other income-

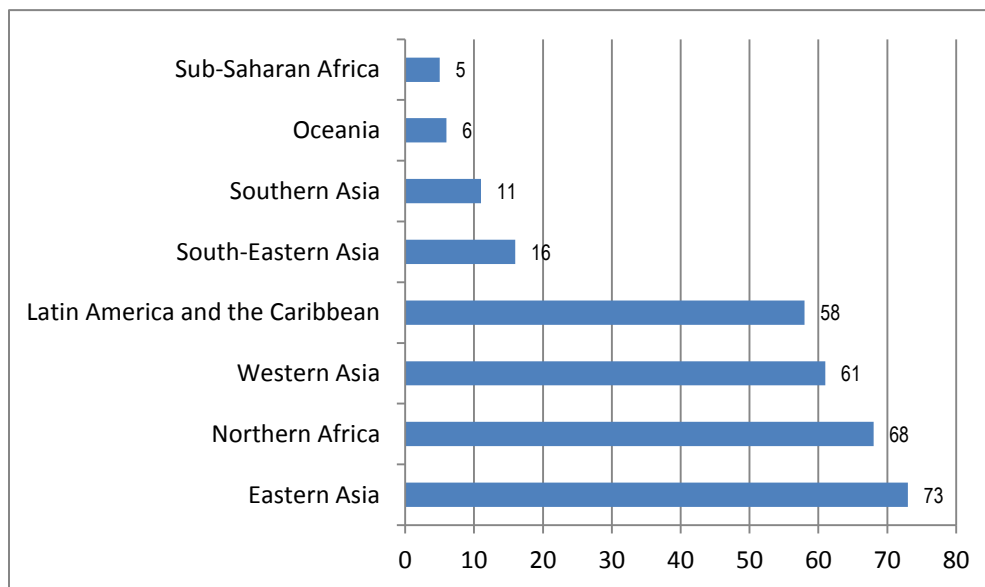
producing activities, family subsistence, or education.

(Modi et al., 2005, p. 25)

In developing regions worldwide, only 49 percent of the populations enjoy the convenience of piped drinking water on the premises, according to UN Millennium Development Goals (MDGs) data. However, in Sub-Saharan Africa, this proportion falls steeply to just 5 percent (it is much higher, at 68 percent on average, in North Africa). Data for the different global regions are shown in Figure 4. These global comparisons provide the context for the increasing importance of water issues noted above. In 14 out of 30 countries in Sub-Saharan Africa with recent data, in over 25 percent of the households, each water collection trip took more than 30 minutes. This task imposes heavy economic and social costs in terms of the time that could otherwise be devoted to girls' education and women's more productive employment (UN DESA, 2010).⁸

⁸ According to UN data for 45 countries globally, women are responsible for collecting drinking water in 64 percent of households, while this task falls to men in only 24 percent of households. Children are responsible for this daily chore in 12 percent of the households, but girls are twice as likely as boys to shoulder the burden. Usually, multiple water collection trips are required to meet the minimum daily drinking water needs of a family (UN DESA 2010).

Figure 4. Percentage of rural population with piped water in the household, by global region, 2008



Source: UN DESA (2010).

A survey of linkages between climate change and gender conditions mapped the following sequence of impacts of weather variations, water availability, farm tasks, and the consequences for women and girls:

Climate change may also lead to increasing frequency and intensity of floods and deteriorating water quality. This is likely to have a particularly harsh effect on women and girls because of their distinct roles in relation to water use and their specific vulnerabilities in the context of disasters... In drought-prone areas affected by desertification, for example, the time absorbed by water collection will increase as women and children (mostly girls) will have to travel greater distances to find water. The heavy rainfalls and more frequent floods predicted to result from climate change will also increase women's workloads, as they will have to devote more time to collecting water and to cleaning and maintaining their houses after flooding. This is time that could be

spent in school, earning an income or participating in public life. Walking long distances to fetch water and fuel can expose women and girls to harassment or sexual assault, especially in areas of conflict; there are many accounts of women and girls being attacked when searching for water and kindling in refugee camps.... In urban areas, water collection is also an issue as women and girls may spend hours queuing for intermittent water supplies.

(Brody et al., 2008, p. 5)

Researchers have cited studies in Tanzania comparing women's and men's time-use in a number of common farm and related activities, including: water and firewood collection; crop establishment, weeding and harvesting; marketing and processing. Research has shown that women's time amounted to more than 1,800 hours per year per able-bodied female, compared with less than 500 hours per year per able-bodied male for the same activities. Of these, 750

hours of women's time were apportioned to fuel and water provisioning, while the same tasks occupied less than 50 hours of men's time. It is worth noting that Tanzania is one of the countries in the list of "top ten" countries most vulnerable to climate change (see Table 1). Women make up around 55 percent of that country's agricultural labor force, although these time-use data indicate that women's share could be even higher, depending on survey methodology and definitions.

How might water stress affect women and children, and MDGs attainment? Figure 5a plots malnutrition levels of children under 5 years of age against access to safe drinking water in rural areas. Figure 5b shows the data in a scatter plot for the same countries, indicating that overall, countries with better access to safe drinking water enjoy better levels of child nutrition (data for all countries are given in Annex 1).

Figure 5a: Under-5 malnutrition prevalence and percentage of rural population with access to clean water for selected African countries (latest years available)

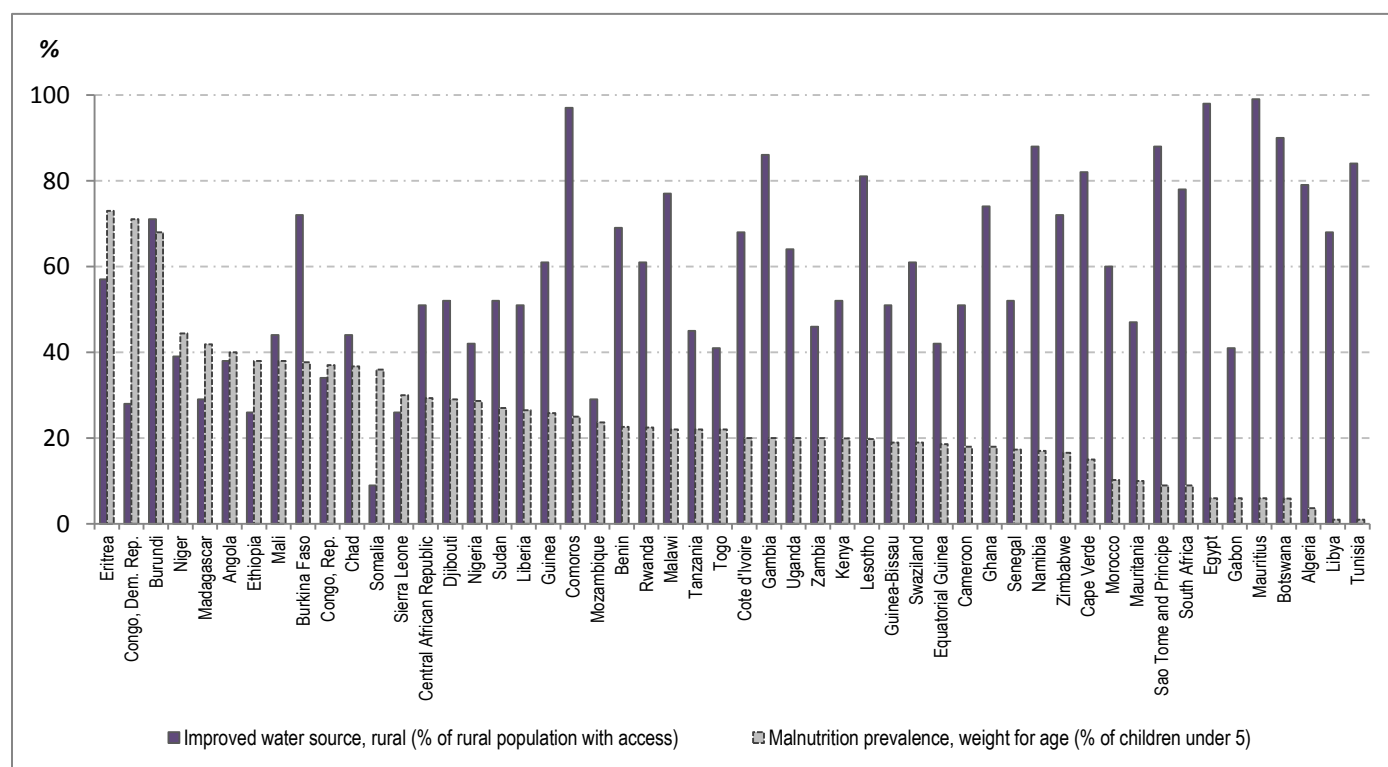
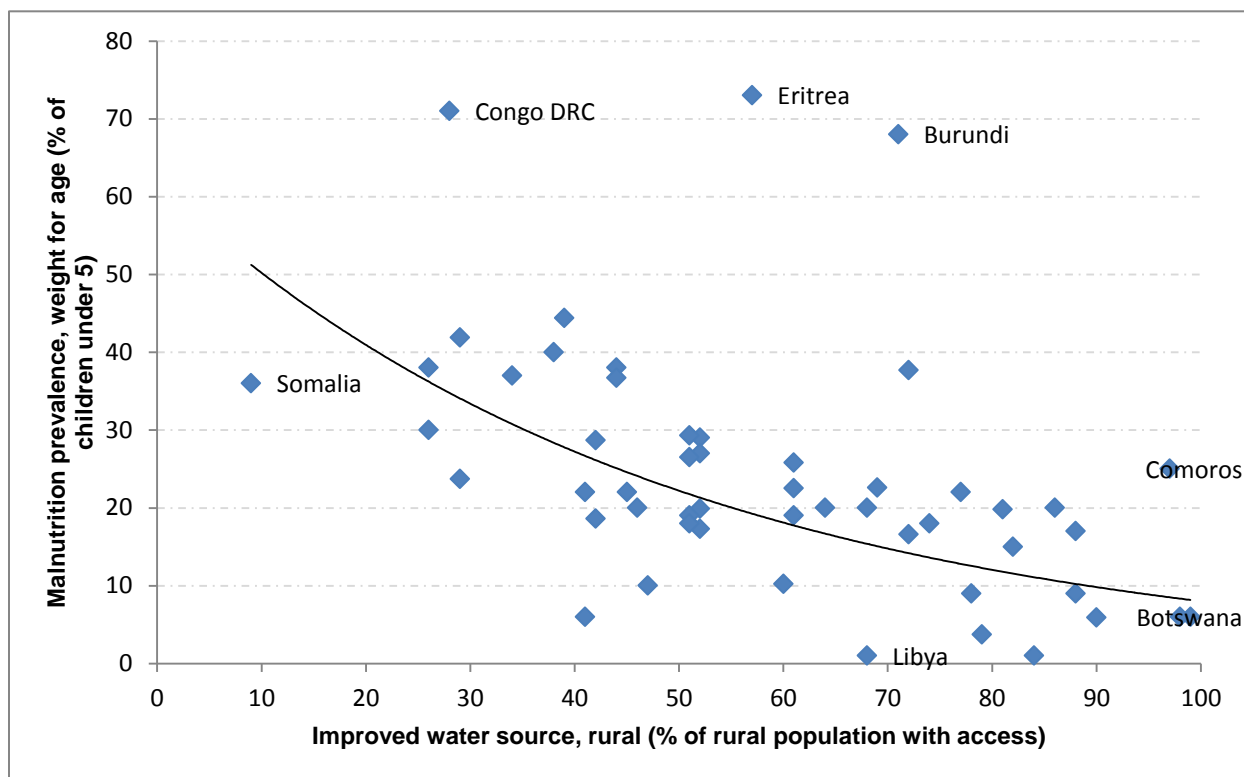


Figure 5b: Percentage of rural population with access to improved water source and percentage of malnourished children under-5s



This apparent correlation may illustrate the positive impact that better access to an improved water supply has on mothers' time, energy, working and caring capacities. It may well be the case that when safe water is not easily accessible, more time is spent on provisioning trips; consequently less time is spent on ensuring adequate nutrition for families, whether by allocating time to meal preparation, food cultivation or purchase. Notwithstanding, there may be other factors to account for the correlation, such as (i) better economic conditions in localities that afford improved water sources, as this would play a role in facilitating transport of inputs and produce and (ii) better access to health information and services. Conversely, some countries with better water access may have

poorer child health outcomes due to other factors, such as limited public services outreach.

Such approaches illustrate the “efficiency” arguments for lightening women's work; that is, they focus on the *instrumental value* of gender equality – the contribution that this makes to better outcomes for families. We have seen how rising water stress may severely impact women's capacity to ensure good levels of health and nutrition for their families. The next section examines how water stress, drought and environmental disasters may also give rise to conflict. This can impact women's rights to land and to safeguarding a decent livelihood.

6. Crisis and Conflicts – their Gendered Impact on Access to Water and Land

Current research points to the potential for conflicts within and among states resulting from natural resource stress, such as: competition for water, agricultural and grazing land amongst local people; internal or cross-border migration, especially of nomads in search of water and grazing; and food shortages related to poor weather and climatic conditions. Climate-induced disasters such as floods and drought have been observed to affect gender roles and outcomes in livelihoods. Analyses of mortality rates indicate that because of their poorer health, nutrition, and living and working conditions, women are 14 times more likely than men to die during natural disasters. Many factors contribute to these outcomes:

Case studies suggest that public shame, social and clothing inhibitions, and lack of survival skills (swimming, climbing trees, etc.) contribute to a greater death rate of women compared with men in hurricanes and floods. Moreover, women often care for children, the sick and elderly, and may place themselves at higher risk to do so.

Women are more often found in structurally weak buildings at higher risk of collapse due to mud slides and other climate-related hazards, since they are prone to congregate compared with men in places of lower social value — such as in market stalls, schools and shanties.

(UN Women, 2011)

Whether in conflict, crisis, or competitive transactions, there is a grave danger that women's voices are not heard often enough at the consultation table. If such an absence is allowed to continue, the solutions proposed may fall short, prove ineffective,

or sustain harm to the initial victims, rather than safeguarding their interests.

For example, in the complex setting of West Africa, 17 nations share 25 transboundary watercourses. As one commentator notes, “In recent years more and more cases are noted where communities and even government authorities tend to blame upstream countries for phenomena such as deficits in discharges or rivers, floods, water weeds, etc. ... which, in many cases, appear to be rather linked to climate change and variability” (Niasse, 2005). Researchers have called for better monitoring and sharing of data on changing environmental conditions, and for enabling mechanisms to help states resolve conflicts through consultation. At the same time, some have questioned whether women are effectively participating in the consultation process.

In order to ensure that women's voices are heard at the table, the *Maputo Protocol on the Rights of Women in Africa* was adopted by the African Union Commission (AUC), and came into effect in 2005.⁹ Article 19 of the Protocol sets out parameters for the right to sustainable development, calling for the realistic participation of women in development planning; guaranteed land and property rights; and greater access to credit, training, skills development and extension services to promote economic rights and combat poverty. Women's NGOs have called for full ratification and implementation of the Protocol, and for enhanced allocation of resources for climate change mitigation and adaptation. They have highlighted the need to ensure that land reforms (such as titling programs) and the

⁹ The Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa came into effect in November 2005 upon ratification by 15 countries.

advance of agribusiness do not result in loss to communities of common resources (DAWNnet.org, 2011).

These fears have been raised as a consequence of real-life events. In 2010, the World Bank published a report that it had commissioned into the consequences of rising food and fuel prices, which have created incentives for large-scale land acquisition. Using a number of case studies of large land acquisitions, including 960 in Africa, the authors concluded that, “it is more important than ever for governments and the international community to protect local land rights” (Deininger and Byerlee, 2010). The report found serious neglect of women’s interests, and those of communities deemed vulnerable, in the consultations mandated for land transfer projects:

Many of the projects studied had strong negative gender effects, either by directly affecting women’s land-based livelihoods or, where common property resources were involved, by increasing the time required of women to gather water or firewood and take care of household food security. In many cases, it was presumed that land rights were in the name of men only, and consultations were limited to males in the community, leaving women without a voice. ...

Vulnerable groups, such as pastoralists and internally displaced people, were excluded from consultations in an effort to override or negate their claims. Without proper safeguards, they then became aware of pending land use changes too late to be able to voice concerns. Females and other vulnerable groups are also less likely to obtain employment from investors or be included in decision-making processes surrounding the investment.

(Deininger and Byerlee, 2010, pp. 69-70)

Such findings have motivated the call by gender advocacy networks for recognition firstly of women’s roles in the agricultural sector, especially the subsistence subsector for food production, and secondly, of women’s land rights. The latter must be recognized, codified, and supported with adequate productive resources.

The United States Economic Commission for Africa (UN ECA), has pointed out that failures in systems related to land use and control have lain at the heart of “the majority of conflicts in Africa, and indeed around the world, including the recent wars in Rwanda, Burundi, the Democratic Republic of Congo, and Cote d’Ivoire” (Janneh, 2006). He linked the vital question of land tenure systems to women’s rights and conditions:

It is an irony that the most marginalized members of our society are the same people tasked with harnessing land for food security and development. They are also expected to be the ‘keepers of the environment.’ In Africa, women constitute 70% of the agricultural labour force and 90% of the labour for collecting firewood and water. They are largely rural dwellers. ...The majority of these women, like other African women in general, do not own or control land and other natural resources. Indeed many of them only gain access to land through a male relative. This means that women in Africa cannot participate and contribute adequately to development. And they do not fully benefit from the wealth created by the use of land and its resources.

(Janneh, 2006)

Security of land tenure is one of the most fundamental of economic rights. When women lack title to land or housing, they have to face a narrower choice of economic options. They lack collateral on which to access credit to acquire other assets. Any

serious effort to support people's capacity for action on adaptation needs to address gender rights in land access, ownership, and the opportunity to make real choices.

7. The Way Forward: Appropriate Responses, Gender Dimensions

Mitigation, adaptation, and opportunities

Countries have responded to climate change through efforts aimed at both “mitigation” and “adaptation.” The first response, *mitigation*, consists in limiting human contributions to climate change by reducing pollutants, mainly emissions of greenhouse gases (carbon dioxide or CO₂), and by developing carbon sinks to absorb them. While most greenhouse gases are produced by the industrialized countries, the impact of climate change has fallen most severely on the developing countries. The African continent as a whole contributes only 3.8 percent of total greenhouse gas emissions but, as noted throughout this article, its people and resources are ranked the most vulnerable to the impacts of climate change. The second response, *adaptation*, focuses on finding ways (e.g. policies and initiatives) to reduce the vulnerability of populations to the impacts.¹⁰

The first decade of international discussions on climate change focused on *mitigation*, with limited real results. This was despite significant expenditures, such as the Clean Development Mechanism (CDM), which it was hoped might deliver some US\$18 billion globally by 2012 – of which less than

¹⁰ The AfDB's *Climate Risk Management and Adaptation Strategy (CRMA)* defines adaptation as: “A process by which strategies (policies, actions and other initiatives) to moderate, cope with or take advantage of the consequences of climatic events are enhanced, developed and implemented.”

US\$ 650 million would be targeted to Africa and the Middle East combined (World Bank, 2010, p. 262).¹¹ As discussed in the first section of this article, if mitigation is unlikely to produce results quickly enough, then the challenge for peoples and policymakers alike is to find better ways of adapting to the changes that are coming, and to many that are here already.

The process of *adapting* to climate variability is a familiar preoccupation of farmers, both women and men. Farmers adapt by changing crops or varieties, choosing different harvest and sowing dates, altering land management, and employing water efficiency techniques. Nevertheless, in the face of long-term climate change, new challenges arise. It is here that governments and development agencies can play an important role in building people's coping capacities. The adaptive capacity of women and men depends on how they can draw from resources to maximize their livelihood outcomes. In this sense, adaptation depends on factors such as economic status, technology, health, education, information,

¹¹ In 1992, 154 nations signed the UN Framework Convention on Climate Change (UNFCCC), and a “Conference of the Parties” to that agreement was convened in 1995 in Berlin, designated “COP 1”, with follow-up meetings held annually since that time. The initial focus of the COPs was on limiting global emissions of greenhouse gases, or “*mitigation*” of climate change, through action by the industrialized countries which are the main producers of such gases. At COP 3 in 1997, most industrialized countries signed the Kyoto Protocol, which adopted targets and timelines. COP 3 also launched the Clean Development Mechanism (CDM) to finance some of the costs of switching to new technologies. The session also authorized the use of revenues from the Mechanism to assist developing countries in clean energy development. In 2007, a 2 percent levy on the CDM was proposed as an “adaptation” fund to assist projects in developing country members of the Kyoto Protocol. The levy began operating in 2009.

skills, infrastructure, access to assets, and management capabilities.

Differentiated power relations between men and women and unequal access to and control over assets mean that men and women do not have the same adaptive capacity. Instead, as we have shown in this article, women are characterized by distinct vulnerability and exposure to risk. Nonetheless, on the positive side they are also endowed with strong coping capacities in the face of climate change and can play an active role in adapting to its impacts to secure food and a livelihood for their households. As the AfDB recognizes:

Gender components determine adaptation strategies and contributions. For example, as a result of gender-differentiated roles in agro biodiversity management, women often have greater knowledge of indigenous plant varieties with important nutritional and medicinal values. As the keepers of seeds, women often possess knowledge of a variety of genetic resources to adapt to varying climatic conditions such as resistance to drought or pests. However, because men have more secure access to land or land tenure, they have more incentive to contribute to effective natural resource management, use, and contributions necessary for adaptation. Gender also often determines who receives inputs for adaptation strategies. Frequently, new agricultural technologies bypass women farmers, despite women's knowledge. For example, extension personnel introducing new varieties intended for higher drought or heat tolerance rarely speak directly with women farmers.

(Adapted from AfDB 2009d, p. 15)

In discussing adaptation to climate change, it is important not merely to focus on women's vulnerabilities, but to understand their specific capabilities. Women's experience and strategic position in society furnishes equips them with the potential to lead efforts

at community and national levels. This is an understanding vital to good policy and advocacy. At the same time, support for adaptation approaches will inevitably be more effective when it leverages women's traditional strengths.

Policy responses to climate change hold the potential for real change in people's daily lives – for the better. To take advantage of these potentials, program designers need to look to the pool of capacities in communities, and the opportunities that adaptation approaches can present. The dimension of *gender* in society is one such opportunity. The social and economic changes demanded in response to important environmental change can provide an impetus to accelerate the transformation of African society and the advent of gender equality in the division of labor, the sharing of responsibilities, and access to and stewardship of resources. For example, we have seen that workable solutions to agricultural strains underline the urgent need to repeal customary property ownership arrangements that deny rights to women. To do so, governments and development partners are called upon to ensure the implementation of proposed charters and measures that advance the land rights agenda, and to ensure financing for effective implementation and follow-up support.

Recent initiatives by the international community and pan-African institutions

COP 16 and the Green Fund The UN Climate Change Conference in Cancun (COP 16) in December 2010 established a new Green Fund to help developing countries confront climate change. Furthermore, agreement was reached to work toward “mechanisms to ensure stakeholder input and participation.” This was in response to a proposal by civil

society groups that the Fund should “guarantee the participation and decision making power of affected communities, particularly women, in all areas of its work” (ActionAid, 2011). African delegates to COP 16 supported the AfDB’s proposal that at least 40 percent of the pledges under the Copenhagen Accord (COP 15) should be allocated to Africa (African Development Group, 2010).

The Seventh African Development Forum on Climate Change and Development, 2010, pointing to the findings of the 2007 IPCC report and the classic Stern Review of the Economics of Climate Change (2006), highlighted the range of current and projected impacts of climate change on

Africa’s development. Table 2 below lists the topics identified by the Forum, and notes how potential risks to women’s lives, work, and freedoms can be understood. The major risks are presented in column (1). They revolve around water resources; agricultural productivity and food security; energy constraints; rising sea levels; loss of biodiversity; increased disease burdens; and conflict risks (ECA, AUC, and AfDB, 2010). Column (2) identifies gender burdens, capacities and opportunities, and possibilities. Column (3) notes the kinds of (country) data needed to monitor the pace and impact of change, and evidence for policy and action to support women and families affected by change.

Table 2. African Development Forum framework: Identifying climate change impacts and the links to gender and to data needs

(1) Forum topic	(2) Gender role implications	(3) Data needs: Review of household survey instruments to augment quality, coverage, unit-level data accessible to researchers (government and non-government)
Increasing water stress and water-related conflicts	<ul style="list-style-type: none"> • Time-use of women and girls; impact of water scarcity on livelihoods and child/family health; obstacles to education of girls and alternative occupations of women • Migrations, conflict-linked abuses 	<ul style="list-style-type: none"> • Employment modules: probe for all activities, time used • Application of SNA93 to economic activity • All household members to respond • Measure of water use, by time, value • Education and literacy: all household members, <i>observed</i> literacy • Reasons for drop out or non-attendance • Identification of water source, wet and dry season; time used in each for provisioning; who provisions
Constrained agricultural production and increasing food insecurity	<ul style="list-style-type: none"> • Women’s key responsibilities in agricultural production, processing, marketing and food security • Changes in agricultural division of labor, women’s shifting involvement in 	<ul style="list-style-type: none"> • Probing questions for all activities, time inputs, other inputs • All agricultural plots: all members to respond • Similar approach for non-agricultural activities • Have there been hungry months in past year --How many? Which months? • Income/consumption (“Poverty profile”)

(1) Forum topic	(2) Gender role implications	(3) Data needs: Review of household survey instruments to augment quality, coverage, unit-level data accessible to researchers (government and non-government)
	export agriculture	file accessible with unit-level data <ul style="list-style-type: none"> • Access to micro and small finance, insurance, all financial services • DHS/ MICS health modules accessible to researchers: e.g. presence of anemia, malnutrition indicators by sex; link to household survey or include module in main household survey (to link to poverty/consumption file)
Increasing energy constraints, further compounding challenges for industrial development	<ul style="list-style-type: none"> • Differential time burden (by sex and age) for fuel provisioning, changes • Possibilities to adapt to efficient fuels (women's access to funds, knowledge, assets) • Respiratory health burden of polluting fuels, especially on women and children inside homes 	<ul style="list-style-type: none"> • Fuel sources used: for cooking/ other • Person responsible for provisioning; time used, wet and dry season • Measure of fuel use, by time, value • Source of income for utilities; access to finance for energy adaptations, for other opportunities • Health incident and care issues as above, with focus on respiratory ailments
Rising sea level degrading livelihoods and environment in coastal areas	<ul style="list-style-type: none"> • Forced migrations, women and men • Altered gender roles within household; greater burdens for fuel and water provisioning • Poverty pressures on employment opportunities 	<ul style="list-style-type: none"> • Current condition; changes in community infrastructure since last survey • Migration module: all persons to respond (not "household head"), to provide: <ul style="list-style-type: none"> ○ Time; duration of migration ○ Reasons for migration
Loss of biodiversity, forests and other natural habitats, threatening the well-being of millions of people, whose livelihoods depend on biodiversity resources	<ul style="list-style-type: none"> • As with agriculture (above); also women's role in culling forest, coastal, other products • Economic dependence on bio-resources • Threats to community food and shelter security from traditional natural setting, forced moves to insecure settings 	<ul style="list-style-type: none"> • Probing questions, as with agriculture section, to include culling activities • As above, agricultural and non-agricultural activities, all household members to respond • Module on assets to include: <ul style="list-style-type: none"> ○ Ownership of transport and implement assets, tools and labor-saving devices ○ Storage and preservation structures ○ All household members to respond • Energy: as with modules above

(1) Forum topic	(2) Gender role implications	(3) Data needs: Review of household survey instruments to augment quality, coverage, unit-level data accessible to researchers (government and non-government)
Expanding range and prevalence of vector-borne diseases, adding to the challenge of the HIV/AIDS pandemic, affecting mostly the poor who live in deplorable conditions and lack access to health care	<ul style="list-style-type: none"> • Greater susceptibility of pregnant women, children, to such diseases; higher mortality rates • Burden of care on women, elderly, children, and impacts on quality of life and opportunities 	<ul style="list-style-type: none"> • Health-seeking module in the survey: all household members to respond • Use of health measures module in the survey (insecticide-treated bednets, vaccinations, supplements) • Community and household health services to be included in the survey • HIV/AIDS module to be included in the survey • Income/consumption file to be made accessible to researchers
Increased risks of conflicts, instability and security threats, associated with massive population migrations induced by extreme climate events.	<ul style="list-style-type: none"> • Forced migrations, greater burdens for fuel and water provisioning • Gender-based violence (GBV) and risks to women in camps and in provisioning • Poverty pressures on employment opportunities 	<ul style="list-style-type: none"> • Basic gender-based violence (GBV) module to be included in the household survey • Preparedness questions to be included in the survey (knowledge, swimming, security, other local elements) • Migration survey as above • Community participation module to be included in the survey • Information, IT module in the survey: who has access, what are costs, frequency of use • Community security services module in the survey (shelters, information, monitoring) • Use of community security services – all household members as respondents

Sources: ECA, AfDB, AUC (2010).

Clim-Dev Africa Fund. It has been estimated that adaptation to climate change in Africa will require US\$ 2–10 billion annually, in addition to normal development assistance (World Bank, cited in African Development Bank, 2009b, p. 5). In 2009, the Climate for Development in Africa (ClimDev-Africa) fund was launched, as a joint initiative of the AfDB, AUC, and ECA, to be hosted by the AfDB. The focus of the fund is on monitoring climate information and on the capacity development of national

specialists, with a small amount destined for pilot adaptation projects in three countries. The First Phase (2009–2012) has an indicative budget of about US\$ 136 million. The follow-up phase of the project (until 2020) is estimated to cost about US\$ 800 million (AfDB 2009b, p. 12).

African Development Bank's climate policies. The African Development Bank (AfDB) recognizes the scale of the challenge confronting its regional member countries (RMCs) in respect to climate change. It has

adopted strategic policy documents to address this issue, such as its *Climate Risk Management and Adaptation Strategy (CRMA)*. This adopts a two-pronged approach: to (i) reduce vulnerability within RMCs to climate variability and promote climate resilience in Bank-financed operations and (ii) to build capacity and knowledge within RMCs to address the challenge and ensure sustainability through supporting policy and regulatory reforms that address climate change-related risks. In recognition of the level of funding and assistance needed by RMCs to effectively manage climate risks, the Bank places a great emphasis on close collaboration, harmonization, and distribution of labor with development partners, such as the AU, ECA, UNFCC, UNDP, World Bank, Global Environment Facility, EU, and bilateral partners.

In addition to hosting ClimDev-Africa, the AfDB is adopting Climate Risk Analysis Frameworks (CRAFs) and corresponding methods and tools for use at subregional, country, sector, program and project levels. In the Bank's guidelines for integrating gender awareness in all projects, it notes:

Climate change and gender inequality are inextricably linked. On the one hand, climate change slows progress towards gender equality and poses a challenge to poverty reduction efforts; on the other hand, gender inequality can further worsen the effects of climate change. Consequently, gender mainstreaming must be seen not only as an aspect that requires special attention when conducting activities to mitigate climate risks but also as an important factor in adaptation to ensure success and sustainability of projects.

(African Development Bank Group, 2009d, p.1)

Using its Checklist tool, the Bank directs that every project must, from the stage of project identification, through preparation, appraisal, implementation, and monitoring and evaluation, conduct gender analysis of the climate change issues. Each project should consult with women explicitly as part of the initial design phase and incorporate gender indicators, including baseline conditions and targets in all its results frameworks.

As a guide to project preparation, the Bank has adopted specific directives for verification of climate-related sectors, including water, energy, infrastructure, agriculture and others. For example, gender specialists must be engaged to lead feasibility and impact assessment studies; input data must be disaggregated by sex to ensure that the necessary data are assembled; preparatory studies must involve national women's groups and civil society gender and environment networks; special measures including training should be adopted to ensure appropriate participation levels of women; indicative lists of indicators included in the guidelines must be employed and adapted as appropriate (AfDB, 2009d, pp. 3ff.).

The list in Table 3 below, drawn from the Bank's Checklist, indicates some of the specific data needs and analyses to be verified in selected sector projects. Some measures that could be employed to improve the quantity, relevance and quality of data for project implementation and monitoring are provided in column (3).

Table 3: AfDB indicators and assessment for mainstreaming gender and climate in projects

(1) Sector	(2) Gender and climate analysis and indicators to be assembled/ used	(3) Proposals to augment data availability and quality
Energy	<ul style="list-style-type: none"> • Explicit analysis of <ul style="list-style-type: none"> ○ women and men’s use of energy, and environmental effects ○ differential adaptation strategies used by women and men • Assessment of household fuel use, emissions, and strategies for amelioration of associated health and work burdens, by sex <ul style="list-style-type: none"> • Promotion of clean fuel use • Income generation directed to energy affordability 	<ul style="list-style-type: none"> • Ensure that Bank project planning staff engage / consult with local specialized NGOs, agriculture specialists, legal experts, etc., to design and conduct these data compilation and assessment activities • Incorporate explicit assessment, pre-project and subsequent, of time use (by women, girls, men and boys) to access water and fuels • Similarly, assessment of time-use (by women, girls, men, boys) in specific crops, for relevant activities (e.g., by crop: land and seed preparation, planting, transplanting, weeding, harvesting, transport, storage, milling and other processing) • Budget for costs of data collection and assessment, and of staff to address gender components throughout project
Water	<ul style="list-style-type: none"> • Availability and quality of water resources; changes in these factors • Assessment of water-related disease burdens and changes in these factors 	
Food	<ul style="list-style-type: none"> • Roles in food production and supply, including time use, by sex • Identification of barriers to project participation, by sex • Assessment of land issues, food security, local capacity to integrate and address these issues 	

Source: AfDB (2009d).

During appraisal and implementation, the Checklist additionally calls for the following: (i) consistent verification of women’s participation at all project stages and all levels of membership and leadership; (ii) that budget support for gender targets be confirmed and monitored; and (iii) that data be compiled (AfDB 2009d, pp. 2-9).

8. The Role of Knowledge Dissemination in Climate Change Management and Adaptive Approaches

We are learning from experience that strengthening resilience to climate change also underscores the importance of knowledge and information dissemination. The lessons of community risk-proofing – both positive and negative – confirm the need for mainstreaming gender-sensitive data in National Statistical Systems (NSSs)

to monitor the differential impacts of climate change on men, women, girls, and boys. Information on legal rights, assistance available in times of crisis, etc. need to be made available to all – women, men, youth and the most vulnerable (e.g. displaced persons). The demands of new and complex areas of knowledge in adapting economies and societies to climate change also call for better access to quality education and vocational training to build new production skills and creative capacities for the future.

Table 4 below follows the matrix used earlier in Table 3, indicating in column (1) the environmental management and adaptation programs/projects that are supported by African governments and partner agencies. Column (2) identifies the gender implications of such projects and approaches. Column (3) indicates the data

needed to support the effectiveness of projects and activities. Most data needs can be met by the full use and upgrading of existing data instruments of regional member countries. However, environmental management and adaptation programs, and the African Development Bank's approaches specifically, place great emphasis on the engagement of specialists and methodologies to undertake macro assessments. In particular, they advocate the use of new geographic information system technologies to improve data gathering for African countries, which in the past have been data-poor in vital areas. However, these new data-production and use approaches risk suffering from the familiar gender blindness, if dedicated protocols for the integration of gender orientations and sensitivities are not developed and supported (Slootweg, 2009).

Table 4: Environmental management and adaptation approaches: identifying responses, gender and data links

(1) Environmental management and adaptation approaches and projects:	(2) Gender role implications	(3) Data needs
<p><i>Manage climate risks</i></p> <ul style="list-style-type: none"> • Reducing emissions from land use and land use changes (e.g., deforestation and forest degradation, conversion of wetlands into farmlands, etc.) • Reduce vulnerabilities • Strengthen forecasting and disaster management • Improve the safety of communities 	<ul style="list-style-type: none"> • Support for energy alternatives specific to women's tasks and opportunities (fuels, stoves, processing infrastructure, transport) • Investigate via gender sector analysis: knowledge of forecasting and crisis information protocols • Design and support remedies for gaps identified, via consultation with gender/crisis recovery NGOs • Train women leaders and support profiling leadership • Support/ finance legal 	<ul style="list-style-type: none"> • Improved NSO household surveys, as in Table 3, for better data on time-use, specific by sex and age • Improved emissions, land use, forecasting and related information, with dissemination plans oriented to gender sensitivities (sites of knowledge sharing, means of communication, appropriate dissemination tools and technologies) • Gender-aware ITC access planning • Budget assignment to dedicated local survey

(1) Environmental management and adaptation approaches and projects:	(2) Gender role implications	(3) Data needs
	training, GBV prevention and protection programs	execution and analytical capacity (for knowledge of services, safety infrastructure, response planning)
<p><i>Adapt and increase resilience to climate change</i></p> <ul style="list-style-type: none"> • Ensure access to key resources, including land • Develop community capacities to cope • Reduce exposure to climate risks • Protect fragile ecosystems and renewable resources 	<ul style="list-style-type: none"> • Support adaptations that women and communities have undertaken and sought • Advance ratification and national implementation of land rights, as set out in Maputo Protocol; all projects to be subject to screening for conformity • Repeal customary ownership arrangements that deny women's rights • Support/ finance local government capacity development with gender participation norms and for all training 	<ul style="list-style-type: none"> • Analysis of NSO survey data on water, fuel and input use (see Table 2) • Partnership with local CSOs to analyze NSO data and to conduct local survey • Assessment of the existence of women's community organization(s); means of access to women's voices • Consultation with project beneficiaries and non-beneficiaries, with gender targets for respondent shares • Dedicated sector gender & age group analysis: tasks and time use for water resources, fuel, land, other project components • Donor partner checklists
<p><i>Encourage multi-country approaches to resource management</i></p>	<ul style="list-style-type: none"> • Adopt and enforce norms for women's representation: state level, and civil society • Publicize good practices of women-led initiatives (e.g. in forest management, water use groups, etc.) 	<ul style="list-style-type: none"> • Administrative data on women's participation • Local government databases • Media cooperation partner lists • ITC access programs, including access of poor women, access in remote areas
<p><i>Adopt mechanisms for multi-country dialogue on the use and management of major rivers.</i></p>	<ul style="list-style-type: none"> • In addition to women's representation, as above • Require community consultations that enlist civil society participation in dialogue, with equal gender voice targets identified and monitored in results frameworks 	<ul style="list-style-type: none"> • Administrative data and norms, as above; NSO survey use, as above • Strategic Environment Assessments incorporating local gender perspectives in user, stakeholder review (upper to lower reaches, delta, farm and urban users); water capture; irrigation dimensions

Evidence to support adaptation and advocacy work

While the relatively new area of policy work on gender and climate change has suffered from a penury of country and local data that are gender-specific, it is important to recognize that this weakness need not persist. The evidence required to support gender empowerment and effective adaptation strategies is within our grasp. The most critical evidence is centered on the ways women and men earn their livelihoods, the conditions of their interaction with the natural and built environment, and the quality of their lives and time-use – as well as how these change from one interval to the next. Information on these matters has been gathered in standard programs of National Statistical Systems, while support for National Statistical Offices and country data systems has grown greatly in the past decade. There is a gap, however, between what is potentially available and what data users can presently access and employ.

Data users and policymakers may not realize that their country's official household survey data can provide them with the information that they need. If survey results are made available in the form of raw or unit-level data, government and civil society constituencies can take on the work of analysis and the drafting of policy inputs. It may come as a surprise to advocates – not only in environment networks, but in every gender field – that a new age has arrived, one that sounds the death-knell of the old adage, "No sex-disaggregated data!" The latest computer methods mean that the sex of every household member is entered into the survey database. With the low cost of computer time and the accessibility of statistical software programs, every person in a network can become a data user, and every item of information recorded by the survey on an individual basis can be

disaggregated by sex. This means that surveys that examine labor force activity, agricultural inputs and outcomes, financial sector access, utility resources and costs, decision-making factors, violence and conflict incidence and outcomes – not to mention well-known modules on education, health and demographic factors – are already present in the data arsenal of our national data producers.

Providing assistance to national networks and policy researchers to learn how to access and use existing data, in addition to providing input to data producers, is an important contribution that donor partners can offer to RMCs.

The role of National Statistical Systems

National statistical systems (NSSs) have a key role to play in ensuring that information on the human environment is made available to policymakers and advocates. While the resources and capabilities of national systems vary, the most important factor in raising the effectiveness of data systems for their constituency of data users is *communication* in both directions – between data producers and data users. NSSs need to consult with advocates to ensure full awareness of the types of data that are needed. Data users need support to understand the different data that instruments can provide and how users can put data to use. Some of the responsibilities and opportunities that can usefully be discussed among NSSs and their partners could include:

- Affordable and open access to data for bona fide researchers in every country: providing full access within a reasonable timeline to constituents, while ensuring confidentiality of the respondents' identity at all times; and

- Training for data users in government and civil society to understand the potential of administrative and survey data – what to request; what to expect from a data instrument; how administrative data differ from survey data; how researchers can use data on their own to explore gender and environment relationships that have not necessarily been presented in the initial NSS reports.

Some of the variables already present or easily added to official survey instruments might include:

- **Water resources:** Distance to water source; type; time used; age and sex of persons responsible for provisioning; water for irrigation.
 - These data are available from many existing household surveys: the survey questionnaire needs to ask in the household questionnaire: What is the i.d. code of the person fetching water (in the dry season; in the rainy season)? What is the source of water? (codes for sources).
- **Economic activity:** The survey needs to ask, for each agricultural plot: What is the i.d. code of the person managing this plot and of persons working on it? What is the crop? What inputs/ value were put in last year (fertilizer, pesticides)? What capital improvements? Plots and crops used? Type of irrigation? Identity of persons working on recorded plots? *Similar identification and time-use questions should be asked for each non-agricultural economic activity.*
- **Energy use:** Type of fuel for cooking and lighting; distance, time and cost for provisioning; age and sex of persons responsible for provisioning; local energy and infrastructure supply (grid, community, milling facilities, transport services).
- **Time-use within standard employment modules:** For current and usual economic activity; for main and secondary activity in each – hours per day, days per week, weeks per month.
- **Gender-based violence basic module within standard household survey:** Core set of questions to identify incidence and severity over the previous 12 months; identity of perpetrator (sex, known or unknown to victim of abuse, state or non-state agent); site of events (public, domestic, institutional); type of remedy sought and outcome.
- **Education and literacy:** All children and adults as individual respondents (answering for self); observed rather than reported (use of test sentence).
- **Marital status:** All persons, including under-age; all persons to answer for self.
- **Migration:** Incidence, time, purpose (work or family reasons), duration, place.

9. Conclusions and Recommendations

There is broad acceptance that climate change has already begun to pose a major challenge to sustainable human development, and that no continent is more

seriously endangered than Africa by this threat. In this article we have underscored the evidence that women's lives place them on the frontline of environment-linked risks. The same elements of geography, environmental fragility, and livelihood dependency on low-technology, rain-fed agriculture on which African vulnerability is founded, are at the heart of women's lives. For poor women, their predominant role in agriculture and environment-related jobs heightens the risk. Further, since many are engaged in the informal sector, which is characterized by low earnings and job insecurity, their vulnerability is heightened. Shouldering responsibilities to provide for children, but with little control over the forces determining either market or environmental risks, women face an urgent need to adapt to accelerating change.

The impact of climate change is experienced disparately by women and men, because of the specific social and economic roles they play, and their unequal access to economic as well as natural resources. An effective way to monitor differential and changing impacts is to monitor the time-use of women and men. Other indicators can serve as proxy measures of changes in the access to and use of resources. However, policymakers may find themselves with little guidance on how to locate data on which to base informed decisions and for analysis. It is important to help data users – both government and civil society analysts – to make use of existing country data in innovative ways. This means enabling governments to facilitate wide and timely access to survey and other data, and fostering training in effective data use.

A variety of methods have been used to assess the degree of vulnerability of natural and human systems to climate change. *Social vulnerability* indices may be used to describe a range of factors such as

economic, political, technological, and institutional elements that render a country more or less vulnerable or resilient in the face of climate change hazards. Countries in Africa that appear to be at greatest risk display multiple vulnerabilities. In most of these countries, women make up a large and often majority share of the agricultural labor force. Not only are they active in the traditional agricultural crops; in many cases they are also engaged in the production of non-traditional agricultural exports.

Furthermore, there are strong indications that women's economic activity is undercounted in many countries' statistical surveys, because of weaknesses in the reporting methodology and in the interpretation of standards. The vital work of provisioning the family farm in water and fuel, on which subsistence agriculture depends, is dismissed as "housework" in some country surveys. This approach risks neglecting real costs – for utilities and for women's labor – by treating both as "free." Other environmental issues include women's greater role in natural resource management and ensuring nutrition in the household.

Within this decade, it is projected that up to 250 million people in Africa will be exposed to increased water stress, and agricultural yields may be reduced by half (IPCC, 2007). Climate change can be expected to lead to greater frequency of flood conditions, and deteriorating water quality – with especially severe effects on women and girls. It will mean greater workloads, more time spent queuing, and walking longer distances to find water, thereby increasing exposure to the possibility of sexual assault. These burdens imply heavy social and economic costs in terms of time that could otherwise be used for girls' education and women's employment. Country data show high poverty rates for a large proportion of

countries, and serious rates of undernourishment. Risks to MDGs attainment can be illustrated by country data that show, for example, the correlation between safe water provision and improving child nutrition.

Climate-induced disasters have been observed to exact a heavy toll on poor women, who are restricted in their mobility and access, and may be poorly protected in times of crisis. Increased water stress raises the potential for conflicts within and among states, in the struggle for assured resources. In responses to crisis, whether natural or human-conflict-induced, there is a danger that women's voices are not heard enough at the consultation table.

Whether in crisis or normal times, assured land ownership and access are a vital component of women's security. Failures in systems related to land use have lain at the heart of major conflicts, and African institutions have recognized that land tenure questions are vital to women's rights and conditions. It is important to ensure the

implementation and funding of state agreements such as the Maputo Protocol on Women's Rights, so that these are upheld in legal and economic frameworks, as well as in the courts.

Farmers are constantly adapting to climate and to change, finding new varieties and land management techniques. However, in the face of long-term climate change, governments and development agencies can play an important supportive role, helping to build people's coping capacities. They can intervene specifically to assist women where their vulnerability and exposure to risk are greater. The African Development Forum framework on climate change risks can be used to develop a pertinent response to the particular needs of women and families.

Policy responses to climate change hold the potential to transform people's daily lives – for the better. The social and economic changes needed to confront the environmental risks can be harnessed to usher in greater gender equality in the division of labor, the sharing of responsibilities, and access to and stewardship of resources.

Recommendations

This article has noted several areas in which women need to adapt to climate change. The actions of governments, civil society organizations, donor agencies, and opinion leaders can be brought to bear to support women and families facing resource and economic stress. This can be achieved through policy reform, and by ensuring that needed evidence on which to base policy is more readily available. The data required should be improved, on the basis of existing indicators, including: the gender structure of subsistence agriculture; the choice of agricultural techniques; changes in water stress for women and men responsible for provisioning; and disease burdens, among others.

Actions that can be taken by different actors include the following:

- Strategically focusing on key issues, by ensuring data provision for:
 - Time-use by women, girls, men, and boys;
 - Impact of water stress on livelihoods;

- Impact of fuel needs and provisioning and health burdens, and potentials for the use of efficient fuels;
 - Migration and related rights and abuse issues;
 - Roles and responsibilities in agriculture and changes in the division of labor;
 - Structural changes in agricultural export labor force;
 - Resource management issues relating to forests and land; and economic dependence on bio-resources;
 - Communicable and vector-borne disease burdens, changes, and differential impact on women and children;
 - Gender-based violence and specific monitoring in crisis settings; and
 - Poverty issues, including pressures on employment opportunities.
- Advocating the adoption by all countries, as well as funding for the implementation of state agreements (e.g. the Maputo Protocol on Women's Rights) to ensure women's well-being and legal status. Special attention should be paid to women's land rights, women's representation in crisis prevention and response, and peace-building activities at all stages.
- Ensuring that environmental action and adaptation mechanisms such as Green Funds make provision to:
- ensure that stakeholder input requirements include dedicated specialists and funds for the full participation of women in consultations, action and leadership training;
 - direct dedicated funds to support projects that assist women, particularly in agriculture, informal and trade-related production.
- Improving consultation and cooperation between data producers and data users with the aim of:
- fostering improved and more sensitive data collection and reporting; and
 - enabling NSOs to share the burden of analysis of climate change, gender and MDGs monitoring with their data user constituencies.
- Supporting NSOs to provide affordable and timely access to survey, census, and administrative data for all data users, in state and civil society research positions; and
- Support and technical assistance to accelerate and broaden the application of SNA definitions to women's and men's economic activity – particularly in the unpaid and informal sectors.

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ANNEX 1: DATA SOURCED FROM AFDB'S DATA PORTAL

Data for Figures 2a and 2b: *Poverty rates and undernourishment prevalence for selected countries*

Country	Prevalence of undernourishment (% of population)	Poverty headcount ratio at US\$1 a day (PPP) (% of population)
Tanzania	35.0	88.5
Liberia	38.0	83.7
Burundi	63.0	81.3
Rwanda	40.0	76.6
Mozambique	37.0	74.7
Malawi	29.0	73.9
Guinea	16.0	70.1
Madagascar	35.0	67.8
Niger	28.0	65.9
Nigeria	8.0	64.4
Zambia	45.0	64.3
Swaziland	18.0	62.9
Central African Republic	41.0	62.4
Chad	38.0	61.9
Congo, Dem. Rep.	75.0	59.2
Burkina Faso	9.0	56.5
Angola	44.0	54.3
Congo, Rep.	21.0	54.1
Sierra Leone	46.0	53.4
Uganda	15.0	51.5
Mali	10.0	51.4
Guinea-Bissau	31.0	48.8
Benin	19.0	47.3
Comoros	51.0	46.1
Lesotho	15.0	43.4
Ethiopia	44.0	39.0
Togo	37.0	38.7
Gambia	29.0	34.3
Senegal	25.0	33.5
Cameroon	23.0	32.8
Ghana	8.0	30.0
South Africa	2.5	26.2
Côte d'Ivoire	14.0	23.3
Mauritania	8.0	21.2
Cape Verde	14.0	20.6
Kenya	30.0	19.7

Country	Prevalence of undernourishment (% of population)	Poverty headcount ratio at US\$1 a day (PPP) (% of population)
Djibouti	31.0	18.8
Gabon	5.0	4.8
Tunisia	2.5	2.6
Morocco	6.0	2.5
Egypt	4.0	2.0
Algeria	4.0	-
Botswana	26.0	-
Equatorial Guinea	-	-
Eritrea	66.0	-
Libya	2.5	-
Mauritius	6.0	-
Namibia	19.0	-
Sao Tome and Principe	5.0	-
Seychelles	8.0	-
Somalia	-	-
Sudan	20.0	-
Zimbabwe	39.0	-

Note: [- No data]

Data for Figure 3: Number of agricultural workforce in selected countries, by gender

Country	Economically active female population in agriculture	Economically active male population in agriculture	Total economically active population in agriculture	Female share (%)	Male share (%)	Total population
Ethiopia	14,762,000	17,668,000	32,430,000	0.46	0.54	84,975,606
Tanzania	9,324,000	7,632,000	16,956,000	0.55	0.45	45,039,573
Congo, Dem. Rep.	7,120,000	7,473,000	14,593,000	0.49	0.51	67,827,495
Kenya	6,484,000	6,851,000	13,335,000	0.49	0.51	40,862,900
Mozambique	5,655,000	3,023,000	8,678,000	0.65	0.35	23,405,670
Uganda	5,514,000	5,625,000	11,139,000	0.50	0.50	33,796,461
Nigeria	4,857,000	7,374,000	12,231,000	0.40	0.60	158,258,917
Madagascar	3,776,000	3,281,000	7,057,000	0.54	0.46	20,146,442
Burkina Faso	3,261,000	3,573,000	6,834,000	0.48	0.52	16,286,706
Angola	3,222,000	2,631,000	5,853,000	0.55	0.45	18,992,707
Malawi	3,062,000	2,114,000	5,176,000	0.59	0.41	15,691,784
Sudan	2,789,000	4,275,000	7,064,000	0.39	0.61	43,192,438
Egypt	2,779,000	4,116,000	6,895,000	0.40	0.60	84,474,427
Ghana	2,685,000	3,373,000	6,058,000	0.44	0.56	24,332,755
Rwanda	2,409,000	1,815,000	4,224,000	0.57	0.43	10,277,212
Burundi	2,129,000	1,672,000	3,801,000	0.56	0.44	8,518,862
Guinea	1,972,000	1,992,000	3,964,000	0.50	0.50	10,323,755
Senegal	1,874,000	2,078,000	3,952,000	0.47	0.53	12,860,717
Chad	1,727,000	1,309,000	3,036,000	0.57	0.43	11,506,130
Cameroon	1,718,000	1,916,000	3,634,000	0.47	0.53	19,958,351
Zimbabwe	1,674,000	1,464,000	3,138,000	0.53	0.47	12,644,041
Algeria	1,670,000	1,501,000	3,171,000	0.53	0.47	35,422,589

Country	Economically active female population in agriculture	Economically active male population in agriculture	Total economically active population in agriculture	Female share (%)	Male share (%)	Total population
Niger	1,586,000	2,749,000	4,335,000	0.37	0.63	15,891,482
Zambia	1,514,000	1,741,000	3,255,000	0.47	0.53	13,257,269
Morocco	1,454,000	1,595,000	3,049,000	0.48	0.52	32,381,283
Somalia	1,122,000	1,325,000	2,447,000	0.46	0.54	9,358,602
Côte d'Ivoire	1,112,000	1,963,000	3,075,000	0.36	0.64	21,570,746
Mali	993,000	1,642,000	2,635,000	0.38	0.62	13,323,104
Sierra Leone	815,000	505,000	1,320,000	0.62	0.38	5,835,664
Eritrea	670,000	868,000	1,538,000	0.44	0.56	5,223,994
Benin	663,000	1,011,000	1,674,000	0.40	0.60	9,211,741
Central African Republic	641,000	643,000	1,284,000	0.50	0.50	4,505,945
Togo	598,000	851,000	1,449,000	0.41	0.59	6,780,030
Liberia	417,000	520,000	937,000	0.45	0.55	4,101,767
Mauritania	390,000	334,000	724,000	0.54	0.46	3,365,675
South Africa	353,000	841,000	1,194,000	0.30	0.70	50,492,408
Gambia	326,000	286,000	612,000	0.53	0.47	1,750,732
Congo, Rep.	275,000	212,000	487,000	0.56	0.44	3,758,678
Tunisia	262,000	536,000	798,000	0.33	0.67	10,373,957
Lesotho	237,000	115,000	352,000	0.67	0.33	2,084,182
Guinea-Bissau	221,000	265,000	486,000	0.45	0.55	1,647,380
Botswana	178,000	135,000	313,000	0.57	0.43	1,977,569
Comoros	140,000	129,000	269,000	0.52	0.48	691,351
Djibouti	131,000	151,000	282,000	0.46	0.54	879,053
Namibia	115,000	144,000	259,000	0.44	0.56	2,212,037

Country	Economically active female population in agriculture	Economically active male population in agriculture	Total economically active population in agriculture	Female share (%)	Male share (%)	Total population
Gabon	83,000	99,000	182,000	0.46	0.54	1,501,266
Equatorial Guinea	76,000	98,000	174,000	0.44	0.56	693,385
Swaziland	76,000	64,000	140,000	0.54	0.46	1,201,904
Libya	51,000	22,000	73,000	0.70	0.30	6,545,619
Sao Tome and Principe	16,000	17,000	33,000	0.48	0.52	165,397
Seychelles	15,000	15,000	30,000	0.50	0.50	84,600
Cape Verde	14,000	19,000	33,000	0.42	0.58	512,582
Mauritius	12,000	36,000	48,000	0.25	0.75	1,296,569

Data for Figures 5a and 5b: *Under-5 malnutrition prevalence and percentage of rural population with access to improved water source, selected African countries*

Country	Malnutrition prevalence, weight for age (% of children under 5)	Improved water source (% of rural population with access)
Eritrea	73.0	57.0
Congo, Dem. Rep.	71.0	28.0
Burundi	68.0	71.0
Niger	44.4	39.0
Madagascar	41.9	29.0
Angola	40.0	38.0
Ethiopia	38.0	26.0
Mali	38.0	44.0
Burkina Faso	37.7	72.0
Congo, Rep.	37.0	34.0
Chad	36.7	44.0
Somalia	36.0	9.0
Sierra Leone	30.0	26.0
Central African Republic	29.3	51.0
Djibouti	29.0	52.0
Nigeria	28.7	42.0
Sudan	27.0	52.0
Liberia	26.5	51.0
Guinea	25.8	61.0
Comoros	25.0	97.0
Mozambique	23.7	29.0
Benin	22.6	69.0
Rwanda	22.5	61.0
Malawi	22.0	77.0
Tanzania	22.0	45.0
Togo	22.0	41.0
Côte d'Ivoire	20.0	68.0
Gambia	20.0	86.0
Uganda	20.0	64.0
Zambia	20.0	46.0
Kenya	19.9	52.0
Lesotho	19.8	81.0
Guinea-Bissau	19.0	51.0
Swaziland	19.0	61.0
Equatorial Guinea	18.6	42.0

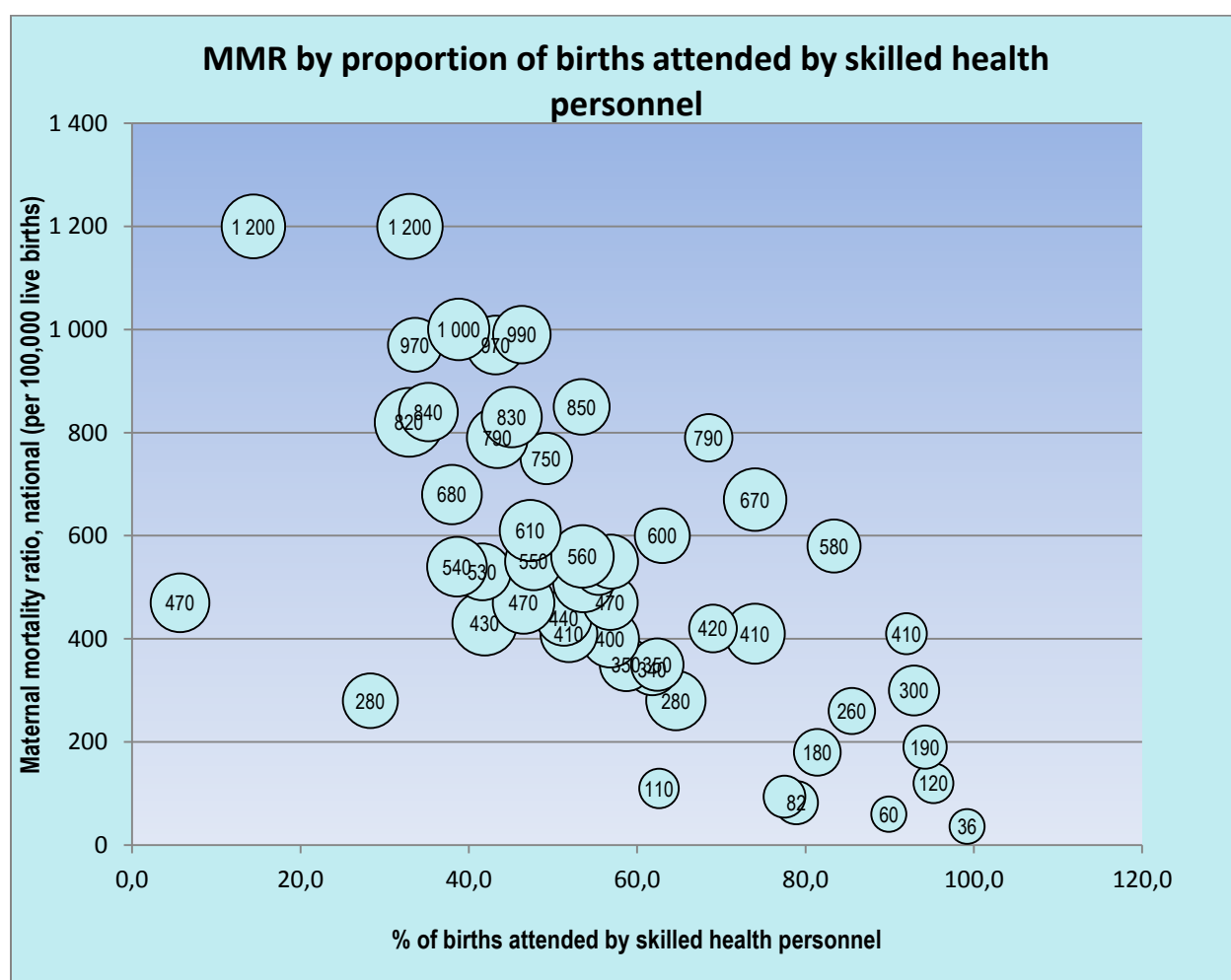
Country	Malnutrition prevalence, weight for age (% of children under 5)	Improved water source (% of rural population with access)
Cameroon	18.0	51.0
Ghana	18.0	74.0
Senegal	17.3	52.0
Namibia	17.0	88.0
Zimbabwe	16.6	72.0
Cape Verde	15.0	82.0
Morocco	10.2	60.0
Mauritania	10.0	47.0
Sao Tome and Principe	9.0	88.0
South Africa	9.0	78.0
Egypt	6.0	98.0
Gabon	6.0	41.0
Mauritius	6.0	99.0
Botswana	5.9	90.0
Algeria	3.7	79.0
Libya	1.0	68.0
Tunisia	1.0	84.0

ANNEX 2. DATA SUPPORT FOR POLICY CHOICES

1. Potential of the AfDB Data Portal for Gender Analysis

Reducing maternal mortality is an MDG that is most at risk in many countries in the developing world, including in Africa. The Maternal Mortality Ratio (MMR) is a key indicator for gender conditions, because it is a measure of how well countries succeed in providing services, such as reproductive health knowledge, prenatal care, and skilled birth personnel to attend deliveries. The cross-country data for African countries provides evidence of the close relationship between support services and better survival outcomes.

Figure A.1: Maternal health (MDG5) factors



Notes: The size of bubble represents Total Fertility Ratio (TFR).

Not all data are available for some countries (e.g. Libya, São Tomé and Príncipe, Seychelles).

* Date shown or latest year available, AfDB Portal.

Table A.1: Maternal Mortality Rate (MMR) by African country

Country	MMR, national (per 100,000 live births) 2008*	Births attended by skilled health staff (% total), 2007*	TFR, Total fertility rate (births per woman), 2010
Chad	1,200	14.4	6.00
Somalia	1,200	33.0	6.31
Guinea-Bissau	1,000	38.8	5.61
Liberia	990	46.3	4.92
Burundi	970	33.6	4.32
Sierra Leone	970	43.2	5.12
Central African Republic	850	53.4	4.59
Nigeria	840	35.2	5.07
Mali	830	45.1	5.35
Niger	820	32.9	7.01
Tanzania	790	43.4	5.47
Zimbabwe	790	68.5	3.29
Sudan	750	49.2	3.95
Guinea	680	38.0	5.24
Congo, Dem. Rep.	670	74.0	5.79
Angola	610	47.3	5.53
Cameroon	600	63.0	4.45
Congo, Rep.	580	83.4	4.17
Burkina Faso	560	53.5	5.77
Mauritania	550	56.9	4.30
Mozambique	550	47.7	4.87
Rwanda	540	38.6	5.25
Kenya	530	41.6	4.78
Lesotho	530	55.4	3.20
Malawi	510	53.6	5.36
Côte d'Ivoire	470	56.8	4.42
Ethiopia	470	5.7	5.10
Zambia	470	46.5	5.64
Madagascar	440	51.3	4.52
Uganda	430	41.9	6.16
Swaziland	420	69.0	3.37
Benin	410	74.0	5.30
Senegal	410	51.9	4.79
South Africa	410	92.0	2.48
Gambia	400	56.8	4.88
Ghana	350	58.7	4.16
Togo	350	62.4	4.08
Comoros	340	61.8	3.81
Djibouti	300	92.9	3.70
Equatorial Guinea	280	64.6	5.23

Country	MMR, national (per 100,000 live births) 2008*	Births attended by skilled health staff (% total), 2007*	TFR, Total fertility rate (births per woman), 2010
Eritrea	280	28.3	4.43
Gabon	260	85.5	3.17
Botswana	190	94.2	2.78
Namibia	180	81.4	3.22
Algeria	120	95.2	2.32
Morocco	110	62.6	2.31
Cape Verde	94	77.5	2.61
Egypt	82	78.9	2.77
Libya	64	-	2.59
Tunisia	60	89.9	1.83
Mauritius	36	99.2	1.80
Sao Tome and Principe	-	80.7	3.63
Seychelles	-	-	-

Table A.2: MMR of African countries, alphabetical order

Country	MMR, national (per 100,000 live births), 2008*	Births attended by skilled health staff (% total), 2007*	TFR, Total fertility rate (births per woman), 2010
Algeria	120	95.2	2.32
Angola	610	47.3	5.53
Benin	410	74.0	5.30
Botswana	190	94.2	2.78
Burkina Faso	560	53.5	5.77
Burundi	970	33.6	4.32
Cameroon	600	63.0	4.45
Cape Verde	94	77.5	2.61
Central African Republic	850	53.4	4.59
Chad	1,200	14.4	6.00
Comoros	340	61.8	3.81
Congo, Dem. Rep.	670	74.0	5.79
Congo, Rep.	580	83.4	4.17
Côte d'Ivoire	470	56.8	4.42
Djibouti	300	92.9	3.70
Egypt	82	78.9	2.77
Equatorial Guinea	280	64.6	5.23
Eritrea	280	28.3	4.43
Ethiopia	470	5.7	5.10

Country	MMR, national (per 100,000 live births), 2008*	Births attended by skilled health staff (% total), 2007*	TFR, Total fertility rate (births per woman), 2010
Gabon	260	85.5	3.17
Gambia	400	56.8	4.88
Ghana	350	58.7	4.16
Guinea	680	38.0	5.24
Guinea-Bissau	1,000	38.8	5.61
Kenya	530	41.6	4.78
Lesotho	530	55.4	3.20
Liberia	990	46.3	4.92
Libya	64	-	2.59
Madagascar	440	51.3	4.52
Malawi	510	53.6	5.36
Mali	830	45.1	5.35
Mauritania	550	56.9	4.30
Mauritius	36	99.2	1.80
Morocco	110	62.6	2.31
Mozambique	550	47.7	4.87
Namibia	180	81.4	3.22
Niger	820	32.9	7.01
Nigeria	840	35.2	5.07
Rwanda	540	38.6	5.25
Sao Tome and Principe	-	80.7	3.63
Senegal	410	51.9	4.79
Seychelles	-	-	-
Sierra Leone	970	43.2	5.12
Somalia	1,200	33.0	6.31
South Africa	410	92.0	2.48
Sudan	750	49.2	3.95
Swaziland	420	69.0	3.37
Tanzania	790	43.4	5.47
Togo	350	62.4	4.08
Tunisia	60	89.9	1.83
Uganda	430	41.9	6.16
Zambia	470	46.5	5.64
Zimbabwe	790	68.5	3.29