FEELING STRESSED

INTEGRATING CLIMATE ADAPTATION WITH OTHER PRIORITIES IN SOUTH AFRICA

BY GINA ZIERVOGEL AND ANNA TAYLOR

Adaptation can be understood as an innate and ongoing process of finding ways to respond to stresses[1] that reduce or combat negative impacts and harness potential benefits of change. But as we are faced with new and severe challenges, such as those presented by global climate change, adaptation needs to be explicitly supported and enhanced. Responding to the current and expected effects of climate change on the ground, particularly in places with pressing development challenges, is an issue that is receiving increasing attention and funding.[2] For example, the Kyoto Protocol stipulates that a portion of the money (a 2 percent tax on transactions) generated under the Clean Development Mechanism be spent on adaptation via the protocol's Adaptation Fund.[3] While the practicalities of managing the Adaptation Fund are still being worked out,[4] two other adaptation pipelines have come onstream in the form of the Least Developed Countries Fund and the Special Climate Change Fund, both managed by the Global Environment Facility. An important concern is that with new money being made available for climate change research, policy development, and practice, people may place too much emphasis on addressing this as an isolated priority to the detriment of other equally pressing social, economic, and environmental issues.

ILLUSTRATION BY KATIE MCBRIDE

In response to this concern, a growing number of people are exploring how communities have and might respond to climate as one of a number of interacting stresses.[5] Because climate stressors affect many aspects of our socioecological system, it is not difficult to intuitively make the connection between adaptation and development challenges such as combating un- and underemployment; improving access to water and sanitation, health care, and education; and empowering people in decisionmaking processes. Following from this, one can see the potential for climate change to hamper the attainment of the Millennium Development Goals and other important international targets.[6]

The nature of climate change presents many challenges in facilitating adaptation; there are high levels of uncertainty in much of the climate science, and climate is only one of multiple stressors that people are faced with. In many places, changes in the climate affect the nature, magnitude, and frequency of a number of existing stresses experienced, while in others it may present completely new threats, such as flooding caused by rising sea levels and disease outbreaks in areas where they have not previously occurred. Equally likely to affect people are a number of stressors that have little or no connection to climate, but which are perceived to be even more pressing. So the impacts of climate change need to be understood and adapted to in the context of multiple stressors. There is an important time element associated with this, as people tend to be more aware of and motivated to act on immediate, more tangible stresses than on climate change, which can have slow onset and incremental impacts.

From the perspective that adaptation and development are innate transformational processes to be supported and facilitated, a study was conducted to evaluate what various actors are doing in Sekhukhune, a district in South Africa's northeastern province, to address important development needs and explore how they relate to climate. Results shed light on how development might be conceived of and facilitated differently in a context of climate change to foster more resilient and sustainable communities. The study also holds lessons for the policy and funding implications of balancing responses to climate change with other development issues.

A South African Case

South Africa has a climate that is variable on a number of time scales. Historical records show that South Africa's climate has wet and dry phases associated with floods and droughts, strongly influenced by El Niño/Southern Oscillation events, which are expected to become more frequent as a result of climate change.[7] Analysis of the historical records indicates significant increases in the intensity of extreme rainfall events and increasing air temperatures.[8]

For the area in northeastern South Africa, where work for this study was conducted, downscaled climate scenarios indicate an increase in rainfall, particularly in the summer and autumn months (when most rain is received), a change in streamflows (expected monthly quantities will shift a month or two earlier), and a notable increase in maximum temperature (likely between 1.5 and 3°C) by 2050.[9] Current and projected climate variability and change significantly affect a number of sectors and a great many people. Changing patterns of rainfall and temperature are likely to affect, inter alia, rates of soil erosion, water availability (for example, via increased evapotranspiration), the threat of waterborne diseases as well as indirect health effects, the frequency and magnitude of drought events, crop yields, food security, rural livelihoods, biodiversity, and ecosystem services. Tackling these negative effects (and harnessing the positive ones) will have to be undertaken alongside many other challenges. Some major concerns at the national level include poverty reduction, service provision, economic development, integrated planning, and improving social security.

COURTESY GINA ZEIRVOGEL

A research team from the Stockholm Environment Institute conducts a meeting with villagers from South Africa's Sekhukhune district.

Adaptation to climate change is only just starting to emerge in policy and practice in southern Africa. Regionally, there has been an increase in funding from international donors who work with local stakeholders but who govern the funding and so often determine the focus as well. In South Africa, climate change has

gained prominence in the last year, with government taking a number of steps. The Department of Science and Technology has identified climate change as one of the "grand challenges" it should address in the next 10 years. The Department of Environment and Tourism (DEAT) has just completed in 2008 the Long Term Mitigation Scenario (LTMS) process, presenting a range of mitigation and climate action options for South Africa and supporting preparations for taking a clear position on the post-2012 dialogue in the international arena. At the city scale, climate vulnerability and impact assessments have been brought on to the agenda and adaptation options explored in the big cities, including Cape Town, Durban, and Johannesburg. In more rural areas, progress on adaptation is varied. The relatively newly instated process of Integrated Development Planning (IDP) at the district level facilitates cross-sector planning and thereby provides an opportunity for adaptation to be factored into a range of activities, although there is not explicit funding for climate considerations, and economic development is usually prioritized. In parallel with government actions, nongovernmental organizations are playing an important role at the local level in implementing climate-sensitive development projects and a few adaptation-specific projects.

COURTESY GINA ZIERVOGEL

Water scarcity is a major stressor for villagers in Ga-Selala, where communal standpipes provide water for domestic and agricultural use.

To better understand the dynamic nature of vulnerability and people's coping and adaptation strategies, ongoing research in Sekhukhune investigates what stressors people think are most pressing, what climate impacts are being felt, and how people are trying to deal with these challenges. People experience and respond to stressors on many scales; in this research, particular focus was placed on the village (local) and municipal (district) scale to understand how actors' perceptions and activities compare. Four questions guided the research:

- What stressors are perceived as the most acute?
- How do actors prioritize responses to these stressors?
- How do these perceptions and priorities differ between those at village and municipal levels?
- How might the prioritized stressors be impacted by climate change, and how do people understand of the need to adapt within a sustainable development framework?

Semi-structured interviews were undertaken with 20 households, followed by a number of focus groups, held separately with men and women, and the completion of a survey with 100 village respondents. Semi-structured interviews were conducted with officials from the local and district municipalities. In two follow-up visits, the initial analysis was fed back to and discussed with the participants, highlighting differences in perception and the need for more integrated research to understand the interactions between various stressors and prioritize actions in view of differential decision-making power and responsibilities. The outcomes show how climate issues can be factored into research and practice from a broader development perspective (including apportioning and directing funding).

Sekhukhune

The history of Sekhukhune is one filled with conflict, predominantly over land rights and the power to govern. Under apartheid (until 1994), much of Sekhukhune formed part of the Lebowa homeland—an area or "reserve" designated for black people of the Pedi ethnic group under the previous government's racial segregation and separate development policies—which has shaped the current environment in terms of politics, demographics, the economy, and the natural and built environment.[10] Now the Greater Sekhukhune District consists of five municipalities. Two villages were chosen for in-depth research: Mohlotsi and Ga-Selala, located within Marble Hall and Greater Tubatse municipalities, respectively (as shown in Figure 1 on page 36).

The district of Greater Sekhukhune covers an area of 13,264 square kilometers and has a population of about 1,125,000, of which approximately 13 percent reside in Marble Hall and 28 percent in Tubatse municipalities, respectively.[11] Of the total population, about 56 percent are under the age of 19 years, nearly 95 percent live in rural areas, and about 66 percent have no formal education.

Sekhukhune lies in the summer rainfall region of South Africa, receiving a mean annual rainfall of between 500 and 800 millimeters.[12] The main economic

activities in Sekhukhune are mining and irrigated agriculture. Platinum, chrome, gold, and palladium mines are situated in the eastern part of the district, and large commercial irrigated farms in the west. A variety of agricultural products are grown, including citrus fruit, table grapes, vegetables, maize, wheat, cotton, and livestock. Scarcity of water is hampering growth in both the agricultural and mining sectors, as is the uncertain status of land ownership—75 percent of the land in Sekhukhune is currently under land claims as part of the national land reform process.[13]

Despite these commercial activities in the area, there is a high level of poverty, with 84 percent of people defined as poor (having less than 1,500 South African rands (R)[14] per household per month) and 66 percent defined as very poor (having less than R550 per month).[15] Sparse rainfall and high evaporation rates limit the success of subsistence farming activities, which include growing maize, pumpkins, and sorghum and rearing cattle, goats, and chickens. Many people in Sekhukhune are not formally economically active. Unemployment in Sekhukhune stands at 69 percent, much higher than the provincial average of 49 percent.[16] As a result, many people migrate to other parts of the country in search of work.

Feeling Stressed

Analyzing the information gathered in the study, it became apparent that while a number of fundamental issues raised by the villagers and municipal officials overlapped, their points of entry often differed, and the actions they prioritized for addressing various stresses varied.

Water stress was prioritized in both of the villages visited. In Ga-Selala, where there are communal standpipes, water stress applies to both domestic and agriculture use. In Mohlotsi, where households receive reticulated water, water scarcity is still a stress, as it limits agricultural production and other economic activities, such as brickmaking. Erosion was a concern in Mohlotsi, especially after heavy rainfall, as this reduces soil quality.

Water scarcity was similarly identified as an important stress by municipal officials, but they see it specifically in terms of bulk domestic supply and the provision of water for irrigated agriculture, particularly large-scale commercial farms that generate large revenue.

Although climate change was not mentioned as one of the key stressors, there were a number of references to its effects, particularly on water resources but also on village infrastructure during floods. Times of below-average or untimely rainfall and years of drought have serious implications for cultivated agriculture and wild foods. Given the past effects of climate change, there was an awareness at the district level that it will likely be a concern in future, though access to climate-related information is limited.

Another key stress at the village level is lack of jobs and income. Income received from family members working locally or further afield, as well as various grants, were mentioned as important means for alleviating financial stress. Villagers highlighted their desire for increasing their skills and receiving training but were unaware of many opportunities. They expect public, more than private, support for economic and agricultural initiatives and rely on the government to provide more opportunities for employment, training, basic services, and village-level support. Some, however, are starting small businesses with the resources they have available to them. For example, two young men have set up a transport business with a donkey and a cart to move goods and people around the local area. Small, weak markets are recognized as a limitation to development within the district. Community-based projects require additional support if they are to be sustainable.

Municipal officials recognize the need to reduce local unemployment, addressing this through public works programs and changes in IDP activities to include local training opportunities. This does not reach all villagers; as a result, it is not surprising that villagers feel this need is not being adequately addressed.

Figure 1. Map of Greater Sekhukhune District and location of villages where research was conducted

NOTE: The villages for in-depth research were selected from previous household surveys undertaken as part of the Food Insecurity and Vulnerability Information Mapping System (FIVIMS), a project commissioned by the South African Department of Agriculture.

Associated with unemployment, there is recognition of high levels of poverty in Sekhukhune. Other poverty-reduction challenges identified by municipal authorities include limited access to land, poor communication between different government stakeholders, and increasing HIV/AIDS incidence in the district. HIV prevalence among women attending antenatal clinics was 16.1 percent in Sekhukhune district, compared to the national average of 29.1 percent in 2006, and the national HIV prevalence among adults aged 15–49 years was estimated at 18.34 percent.[17] Although the prevalence in Sekhukhune is lower than national levels, municipal officials suggested they were seeing an increase in HIV/AIDS, partly because of increasing migration.

Health services are currently stressed and nutrition standards low. An increase in HIV/AIDS impacts is likely to worsen the situation, affecting economic productivity, food security, human resources for government positions (including clinics and schools), and the like.

The lack of skills and capacity, identified at the village level, also affects government functioning. Limited skills in the district mean that people often have to be hired from elsewhere. Living in Sekhukhune is not considered desirable by many who did not grow up there, and consequently, there is high staff turnover within local government. This has a negative effect on the efficiency, continuity, and sustainability of government activities and coordination.

Information collected from villagers and government officials was drawn together to develop "headlines" of the key stressors and associated concerns. This information was presented back and discussed with stakeholders in Ga-Selala and the Tubatse municipality during a second visit (see Table 1 on page 38).

What's Being Done?

Actors at the different scales have different priorities and mandates that influence the activities they undertake. Access to resources (including funding), decisionmaking power, and extent of influence and responsibility play a large part in prioritizing response to stressors (influenced by fads in development, environment, and humanitarian aid), the scale at which work is done, and the sectors that receive particular attention.

At the village level, people find it easier to talk about the stresses they experience than how they are responding to them, potentially because of the integrated nature of these responses. However, people are responding to various stressors in a number of ways. Some responses are short-term coping mechanisms, and people would prefer to find alternative and more sustainable ways to deal with the stress.

At present, adaptation to climate change is not explicitly addressed within Sekhukhune at the district or local level, although there have been responses to climate variability in the past, such as improving disaster response and conserving water.

In response to crop failures, particularly of the staple maize crop, many people are moving away from agriculture and horticulture and are instead looking for wage-earning activities. This can be seen as an adaptation to water and climate stressors. Because of reduced home production, less food is directly available to the household, and more food needs to be purchased, making people vulnerable to food price fluctuations. These altered household spending patterns can affect the quantity and quality of food consumed and thereby levels of nutrition (which is a particular concern for people living with HIV and AIDS). People in the villages linked changes in food production and availability to worsening health, which in turn creates financial stresses (medical costs and inability to work), although they did not mention direct responses to improve food quantity and quality.

While farming at the field scale is happening less, home gardens are a common phenomenon. In Mohlotsi, where houses have piped water, people mentioned that water was too expensive to use for agriculture, but many did have gardens where some produce was growing, largely rainfed. In Ga-Selala, where conditions were drier than in Mohlotsi, many small fenced garden sections were adjacent to the houses. The people here said that they were not able to water their home gardens as there was already high stress on the standpipes for domestic water; the added use of this water source for home gardens caused water to run dry too frequently.

An important response to lack of employment within the village and local area is to migrate, even though it is seen by many as a last resort. Young people particularly tend to migrate in the hope of finding employment in one of the cities or mining areas. Some, however, are unable to move because of financial constraints or the lack of social networks available to support them in the target areas.

At the national level, the government has implemented an extended public works program in response to the lack of skills and high levels of unemployment. This program provides training and matches people to projects, including clearing alien vegetation and providing home-based care. This is a new program and can only support a limited number of people. Further support is needed to address the unemployment problem.

In some of the interviews, government representatives expressed the need for more industry and value-added activities that would provide employment opportunities and bring more money to the district. This is the idea behind supporting growth points as key economic hubs to create markets.

The existing and planned mines in Sekhukhune are seen as an important source of employment, although many local people do not have the necessary skills to work in the mines. As an IDP representative stated,

The level of education in Sekhukhune is not good, so mines bring their own people from outside. But they are developing mining academies to develop local skills and employ local people.

Although mandatory training within mines is being established, training is often basic and therefore limits the range of employment opportunities. However, jobs are still created, which is important

for local development; the more that local people can be involved in the mines, the more money goes into circulation locally, and the fewer migrant laborers, who are often associated with an increase in HIV/AIDS and escalating levels of crime, are needed.[18]

Another exploratory focus for job creation in the district is tourism. Sekhukhune has a number of potential tourist features and places that could be developed. There is high plant endemism, and historically it is very rich. Sekhukhune has both woodland and grassland vegetation types and more than 2,200 species of vascular plants, with new taxa and species still being discovered regularly.[19] However, land claims are slow and restrict development.

Local economic development programs support farmers, assisting with the purchase of machinery and build support for cooperatives. Yet market access is not necessarily improved, and this limits agricultural development. Similarly, garden projects have been supported, yet these are often constrained by market access and water limitations. The products are often low quality and are not value-added goods, limiting their value and demand.

Common small-scale project activities, such as brickmaking, poultry breeding, breadmaking, and car washing, are seen as a means of addressing pervasive poverty issues. Seed money is given to support projects in the early stages, but they are expected to become self-sustaining. While some of these projects succeed, many fail due to the lack of continued support, both financial and otherwise (equipment, maintenance, management, and the like).

Food parcels are distributed to eligible households at certain times by Social Services. Many households rely on government grants, in the form of pensions, child grants, and disability grants (accessible in some areas to HIV-positive people who have CD4 counts[20] below a certain threshold).

Although much is being done to address issues of poverty, one officer summed up her reservations regarding the current approach:

Have you seen projects that help village people? There don't seem to be projects that really help people. The majority

Table 1. Nature and impacts of stressors at different scales

	Ga-Selala (village)	Greater Tubatse Municipality
Water	Domestic is supply limited	Basic services need to be addressed
	Irrigation is not feasible but desired	De Hoop dam will solve problems
	Crops and home gardens suffer without access to water	Industry, mining, and agriculture compete over water resources
Climate change	Climate change affects rain for crops and vegetables	Climate change will lead to water stress
	Climate change is experienced through hotter summers and different rains	There is limited acknowledgement of climate change
		High rainfall variability and drought affect rainfed crops
Food security	High proportion of income is spent on food	Grants are helping households to buy food
	Nutrition is not as good as in the past	Irrigation schemes are being revitalized
	Maize prices are high	Non-food based community projects help support households
	Food societies and family support help with access to food	
Health	Food is less nutritious and linked to poor health	HIV/AIDS is a growing concern
	Medicine is expensive and in limited supply	Quality and extent of health services need to be addressed
	Transport costs to health care facilities are high	Disease is highly prevalent
Jobs	Lack of local jobs leads to high migration	Mines provide potential employment
	Support from government is wanted	Skills are limited within district
	Skills are limited for local projects	There are not enough people for government jobs
	Need to know right person to get jobs	
Communication	Communication regarding opportunities is poor	Communication between government departments is poor
	Government does not respond to requests	It is hard to know what people in the village need
		Expectations are not shared

have negative impacts. The purpose of the project is not met, and when handed over, they are not sustained. People are not consulted first.

This comment really highlights the need for stakeholder participation in and co-ownership of decisionmaking processes involving local activities aimed at achieving sustainable development.

Are Stakeholders Seeing Eye to Eye?

Presenting a synthesis of the findings (see Table 1) back to key stakeholders provided insight into how differing perceptions of the stressors were experienced. This phase of verification and multi-stakeholder dialogue is rarely included in academic research (which is therefore often criticized for being extractive in nature) but can allow information sharing that enables empowering learning for all involved.

The villagers supported what was presented as the main stressors they were facing. They specified further details about some of the stresses. For example, their comments on water were:

Yes, those are the points. People are frustrated that things aren't happening quickly enough. The municipality isn't responding to our needs. Too many boreholes around the village are not working. There are four hand pumps that are all broken, and the municipality doesn't do anything to fix them.

So although they agreed with what was presented as the stressors they faced, open dialogue enabled the socio-political and institutional issues around the stressors to emerge.

With respect to food security, the villagers once again supported the findings, and their disappointment in the municipality's role was clear from the following statement:

We are pleased to get feedback from you [about food security]*, but the municipality does not keep us informed of the outcomes from their visits. The municipality is doing nothing for us. We are now trying to set up our own community garden without support from the government.*

Unemployment is seen as a major stressor both at the village level and for the municipalities, which are trying to create jobs. However, the villagers disagreed with the municipalities' stance that the mines are providing employment. Municipal officers acknowledged that the villagers' requests were not always met, yet at the municipal scale, they noted, they are often trying to address macro-economic issues that do not always directly address micro-economic, environmental, or social issues.

The municipal officials' responses to the findings were also largely supportive, and they provided additional information. For example, they thought sanitation should be adressed in tandem with water access. They agreed that they were not integrating climate change information into their activities but acknowledged that they need to address it. They also acknowledged that grants, food parcels, and irrigation schemes are not sufficient to deal with the problem of food insecurity in the area, but other solutions were not discussed.

The lack of communication between government departments and local communities was discussed in detail. A municipal official felt that the research findings portray a negative message about how government communicates with villagers, when he felt that they engage communities when drafting proposals. He did acknowledge that communication was primarily in English, which is not spoken by many people in the village. There was agreement among the villagers and municipal officers that improved methods and processes of communication are necessary.

Drawing on the analysis and discussions with various stakeholders, a number of points are clear:

- A whole suite of stressors affect people in Sekhukhune.
- A number of climate impacts are mediated through or intensified by other existing sources of vulnerability, such as unemployment.
- Because of their experiences and priorities, different stakeholders view the problems differently and act accordingly.
- Many people are developing and implementing strategies at various scales to cope with existing challenges and adapt to perceived changes; resource deficiencies, however, act as a great constraint to this.
- There is poor understanding and appreciation between groups of the limitations and frustrations felt by other stakeholders.

The lack of effective communication between stakeholder groups (villagers, government officials, and researchers) is curtailing participation in decisionmaking and thereby disempowering all from facilitating positive change (in the form of adaptation and sustainable development).

This highlights a number of challenges that we face and the need for investing in the process of developing adaptation and development pathways as much as, if not more than, trying to buy outcomes. The complexity of the problem highlights the need for an integrated approach to tackling it. There needs to be inter-sectoral planning that incorporates climate information into the decisionmaking process. Researchers have to become better at engaging stakeholders, listening to their needs and perspectives, sharing scientific information, and collaboratively exploring the likely implications. Public participation needs to be enhanced to enable active engagement in the process, ensure priorities are sufficiently aligned, and increase awareness of the existing opportunities and limitations.

Moving Forward in a Changing Environment

Acknowledging the complexity associated with the feedback between exposure to multiple stressors, interventions, responses, and outcomes, we are left with several questions: How might one fund climate adaptation on the ground such that it supports development in a holistic manner while addressing the challenge of climate change impacts? Is the international and national funding being made available for adaptation accessible to people at a range

of scales? What would be suitable criteria for financing an adaptation project that addresses the needs as identified by the people themselves, who see climate as secondary to other stressors?

Having investigated the Sekhukhune case, one can start to suggest some answers. First it is important to contextualize the climate adaptation challenges within the broader goings on in South Africa. As pointed out earlier, although climate change is receiving increased support at the policy level, the commitment and ability to act on the ground is still limited. Funding therefore needs to support other national priorities while addressing the climate change concerns.

In Sekhukhune district, numerous types of adaptation could be supported at the local and district level. Although climate change is expected to most greatly affect agriculture and water supply, the adaptation strategies range from changing crop varieties or moving out of agriculture into small businesses to creating municipal adaptation plans that address resource allocation and improve response to extreme climate events. For example, adaptation actions at the activity scale include conservation agriculture and home gardens. Home gardens address local food needs and are supported within the national Integrated Food and Nutrition Security Programme.[21] Careful consideration needs to be given to how this strategy might be affected by climate variability and what institutional support is needed to ensure success.

Other adaptation strategies might focus on improving access to climate information and changing policies to support water conservation. It is important to recognize that the political and sociocultural environment is often as important in determining adaptation strategies and actions as the physical conditions. Adaptation is often highly constrained by prevailing circumstances, and support is needed at multiple levels to build adaptive capacity and support village-level development. Improved social safety nets and microfinance schemes that empower people and are sensitive to their needs rather than generating increased dependency might be one way to achieve this. Economic opportunities need to be created locally, possibly by stimulating local businesses, adding value to local produce, and creating markets. Government cannot address all needs, so public-private partnerships and private-sector initiatives need to be explored and encouraged. Good communication between all stakeholder groups is a critical element of such initiatives, and it is equally important that actions are aligned to enable positive change.

It is clear from the range of necessary adaptation options in Sekhukhune that funding would need to address multiple scales and sectors. Most adaptation funding is currently project-focused and would not encourage this holistic approach. However, monitoring and evaluation of such cross-cutting intiatives would be a challenge, and there may be overlap with

COURTESY GINA ZIERVOGEL

Home gardens, an adaptive measure to support local food needs, are common in Mohlotsi and Ga-Selala.

activities considered the domain of other funding mechanisms.

A focus on the local scale has helped to highlight that when developing climate adaptation projects and screening adaptation portfolios for funding priorities, governments and funders need to consider people's vulnerability to a number of interacting stressors and place this in the context of a range of possible climate futures for an area. One associated challenge is finding people with the necessary skills to understand and use climate information and work with a variety of stakeholders. Money can and should be well spent on building this capacity. Another challenge is finding tools and approaches that support a holistic response.

The weADAPT Group[22] is currently developing a collaborative platform that brings together a range of tools, methods, and experiences relevant to the adaptation process. The aim is to develop an integrated approach to analyzing climate information, assessing vulnerability to multiple stressors, selecting adaptation options, and facilitiating communication among a wide range of stakeholders. It includes a tool called the Climate Change Explorer that provides downscaled climate scenario data from 11 models for Africa. This tool facilitates access to data, which can be challenging in Africa. It provides summary statistics and visualizations that can be chosen according to user needs. For example, a water resource manager can chose just to see the frequency of rain days with precipitation greater than 20 millimeters or maximum temperatures over the summer months. In addition to the tool, there are a number of documented methods, including one on livelihood sensitivity analysis that helps to link climate events to livelihood assets and activities. The platform is also an online space to share experiences and lessons in adaptation activities. Often, however, municipal officials do not have good access to the Internet, and perhaps this is one area that could be considered when exploring adaptation strategies that improve awareness and information uptake.

Given the growing evidence for and understanding of climate change dynamics and impacts, it is likely that funding for adaptation will increase, particularly in developing countries, whose contribution to the problem is the smallest but where the effects are expected to be greatest. It is imperative that this increase in international adaptation funding does not undermine development and the priorities of these countries and communities. Support is needed for collectively exploring ways of adapting to climate change that reduce people's vulnerability to multiple stressors and increase well-being.

Gina Ziervogel is a researcher at the Climate Systems Analysis Group, University of Cape Town, and the Stockholm Environment Institute. Her work focuses on the vulnerability and adaptation of livelihoods in southern Africa to climate variability and change, with a focus on how climate interacts with other stresses such as water, health, and food security. She may be contacted at gina@csag.uct.ac.za.

Anna Taylor currently works at the Stockholm Environment Institute's Oxford Office in the field of sustainable development, with a research focus on stakeholder engagement in adapting to multiple stresses, particularly in Africa. She previously worked in South Africa researching technology transfer in the context of climate adaptation and investigating household risks in urban informal settlements. She also spent time working in Ghana on small-scale community development projects. She may be contacted at annactaylor@gmail.com.

NOTES

1. The terms *stresses* and *stressors* are used in the text to mean slightly different things. Stressors are viewed as constraining factors or influences that can alter existing equilibriums and constitute a stress (drawing on the dictionary definition of stressor). Households or individuals will experience these multiple prevailing stressors as a suite of stresses (multiple stresses). In other words, a stress is something that a certain "exposure unit" will face as the result of a stressor, and so the stress experienced by different people might vary for the same stressor.

2. S. Gigli and S. Agrawala, *Stocktaking of Progress on Integrating Adaptation to Climate Change into Development Co-operation Activities* (Paris: Organisation for Economic Co-operation and Development, 2007); E. L. F. Schipper, "Conceptual History of Adaptation to Climate Change under the UNFCCC," *Review of European Community and International Environmental Law* (RECIEL) 15, no. 1 (2006): 82–92; and O. Davidson et al., "The Development and Climate Nexus: The Case of Sub-Saharan Africa," *Climate Policy* 3, supplement 1 (2003): S97–113.

3. A. Abdullah, B. P. Jallow, and M. Reazuddin, "Operationalizing the Kyoto Protocol's Adaptation Fund: A New Proposal," Sustainable Development Opinion paper series (London: International Institute for Environment and Development, 2006).

4. A decision was taken at the recent United Nations Climate Change Conference (COP 13) that an Adaptation Fund Board will be established to operate the fund, comprising 16 members representing Parties to the Kyoto Protocol, with the Global Environment Facility providing secretariat services and the World Bank serving as the trustee (both on an interim basis).

5. S. Huq and H. Reid, *A Vital Approach to the Threat Climate Change Poses to the Poor. Community-Based Adaptation: An IIED Briefing* (London: International Institute for Environment and Development, 2007); and G. Ziervogel, S. Bharwani, and T. E. Downing, "Adapting to Climate Variability: Pumpkins, People, and Policy," *Natural Resource Forum* 30, no. 4 (2006): 294–305.

6. W. N. Adger, S. Huq, K. Brown, D. Conway, and M. Hulme, "Adaptation to Climate Change in the Developing World," *Progress in Development Studies* 3, no. 3 (2003): 179–95; Gigli and Agrawala, note 2 above; and R. J. T. Klein, E. L. F. Schipper, and S. Dessai, "Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions," *Environmental Science and Policy* 8 (2005): 579–88.

7. G. F. Midgley et al., *Assessing Impacts, Vulnerability and Adaptation in Key South African Sectors: A Background Study for the Long Term Mitigation Scenarios Assessment* (Cape Town, South Africa: Energy Research Centre, 2007).

8. Ibid.

9. Ibid.

10. R. Aird and E. Archer, *Sekhukhune Background Document*, FIVIMS-ZA report, Kayamandi Development Services & Climate Systems Analysis Group (Cape Town, South Africa: University of Cape Town, 2004); and R. Zanner et al., *Institutional Analysis of Sekhukhuneland ISRD Node*, FIVIMS-ZA report (Cape Town, South Africa: Human Sciences Research Council, 2004).

11. Aird and Archer, ibid.; and Department of Water Affairs and Forestry (DWAF), *Water Services Planning Reference Framework, Sekhukhune District Municipality* (Pretoria: DWAF, inviromap, and GPM Consultants, 2005).

12. DWAF, ibid.

13. Greater Sekhukhune District Municipality, *2004/2005 IDP Review* (Sekhukhune, South Africa: Greater Sekhukhune District Municipality, 2005), http://www.sekhukhune.gov.za/legs_docs/plans/_PDF/Sekhukhune_IDP.pdf (accessed 22 May 2006).

14. At the time of writing, US$ 1 equalled roughly R7.

15. DWAF, note 11 above.

16. Greater Sekhukhune District Municipality, note 13 above.

17. Department of Health South Africa, *Summary Report: National HIV and Syphilis Prevalence Survey, South Africa 2006* (Pretoria, South Africa: Department of Health South Africa, 2007).

18. B. Williams, E. Gouws, M. Lurie, and J. Crush, "Spaces of Vulnerability: Migration and HIV/AIDS in South Africa," Migration Policy Series No. 24 (Southern African Migration Project, 2002); and International Organisation for Migration, *Mobile Populations and HIV/AIDS in the Southern African Region: Recommendations for Action* (Pretoria, South Africa: International Organisation for Migration, 2003).

19. Williams, Gouws, Lurie, and Crush; and International Organisation for Migration, ibid.

20. A person's CD4 count is an indication of how strong one's immune system is and thereby how far advanced the HIV disease is and what possible health threats one is at risk of. When the count reaches a certain low level, one may be advised to start taking medication to prevent opportunistic infections.

21. Department of Agriculture, Republic of South Africa, *The Integrated Food Security Strategy for South Africa* (Pretoria, South Africa, 2002), http://www.sarpn.org.za/documents/d0000497/P444_IFSS.pdf (accessed January 2008).

22. For more information visit www.weADAPT.org.