MODULE 9

Gender in Rural Infrastructure for Agricultural Livelihoods

Overview

The provision of rural infrastructure has been a core priority of governments for many decades to improve the welfare of rural populations and increase the productivity and value added from agriculture and other economic activities in rural areas.[1] The recognition that gender equity should be an important aspect of rural infrastructure policies and programs is more recent. Various studies have increasingly documented four major differences between men and women with respect to rural infrastructure: (1) differences of needs for the type and location of physical infrastructure; (2) differences in priorities for infrastructure services; (3) unequal opportunities to participate in decision making on the choice of infrastructure services, both within the households and within the communities, or to participate in the implementation of the infrastructure programs and the delivery of services; and (4) significant disparities in access to infrastructure services.

Rural infrastructure covers a wide range of physical infrastructure and derived infrastructure services. In this Module, the emphasis is on energy, transport, information and communication technologies (ICTs), sanitation and hygiene services, and potable water. Other types of rural infrastructure, such as irrigation, schools, health centers, administrative buildings, and markets, are not included. Irrigation is covered in Module 6, markets are covered in Module 5, and social and administrative infrastructures will be referred to only briefly. Each of these sectors has many different services, modes of delivery, variation in coverage, and range of users as well as technical parameters for construction, rehabilitation, and maintenance, thus making it difficult to generalize about gender and infrastructure issues. The distinction between the physical infrastructure and services is critical because the provision of the physical infrastructure will not suffice to achieve improvements in rural livelihoods if the technology or the services that enable the use of the infrastructure are absent or deficient. In addition, significant regional and country variation exists in gender issues and the economic, political, institutional, and sociocultural context of infrastructure that needs to be taken into account (Clarke 2007).

This Overview provides the framework for developing gender-equitable rural infrastructure policies, programs, and projects and illustrates the significance and merits of integrating gender equity for the sustainability of rural infrastructure investments and services.

THE FRAMEWORK AND SIGNIFICANCE OF GENDER FOR SUSTAINABLE RURAL INFRASTRUCTURE

Recognition of gender in the design, implementation, and use of rural infrastructure policies, programs, and projects is vital for achieving poverty reduction and sustainable agricultural livelihoods. Rural infrastructure plays not only a significant *economic* role but also a critical role in the *human*

capital development of rural populations and a fundamental *social* role as a factor of change in the economic and social fabric of rural communities. Rural infrastructure and infrastructure services impact rural populations in many ways, ranging from self-respect (in the case of sanitation and hygiene), to accessing health and education, to enabling rural populations to increase their productivity, access markets, improve their welfare, and emerge from isolation. Understanding those impacts on men and women as well as the gender disparities in *risks and vulnerabilities* should guide the work on rural infrastructure.

It is important to note that the relationship between social empowerment, human capital development, and economic empowerment is not linear; it is more akin to a positive spiral (see fig. 9.1). A complex interrelationship exists between them, and the change process is iterative. A certain amount of social empowerment is needed to get women out of the domestic sphere into economic endeavors that lead to economic empowerment. Full-blown social empowerment takes a long time to achieve, such that opportunities leading to women's economic empowerment frequently also provide opportunities for their social empowerment. Increased human capital is needed to achieve economic empowerment and, in turn, economic empowerment enables human capital development. Furthermore, different risks and vulnerabilities affect each gender group in each sphere.

The significance of gender for sustainable rural infrastructure: key characteristics and differential impact

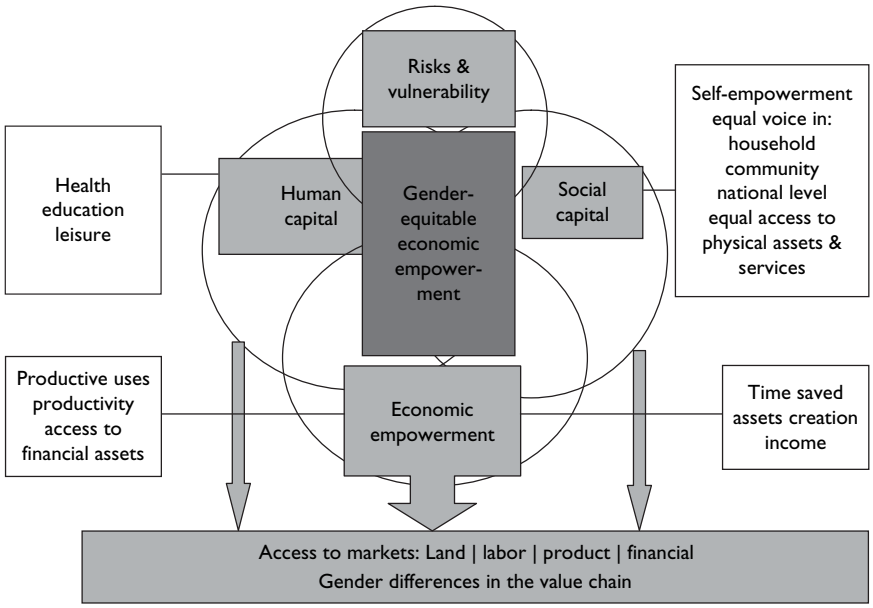
Integrating gender in sustainable rural infrastructure policies, programs, and projects is a matter of development effectiveness. Understanding the linkages between gender equity and development effectiveness is essential: what are the gains, in terms of outcomes, and what are the essential characteristics of rural infrastructure and derived services that must be taken into account when designing policies and programs.

Time saving

At the heart of gender inequalities is the gendered division of labor, access, and control of resources embedded in the household economy and the household economy's interdependence with the market economy. Although men focus on market income, women juggle multiple roles supporting the household economy, community services, and market income, when possible. The household economy is "invisible" and uncounted in national accounts, yet the market economy depends on it.

Time is an economic good. The time costs associated with a heavy domestic labor burden place constraints on women's labor time as both family and hired labor. In the absence of physical infrastructure to support the household

Figure 9.1 The Four Dimensions for Infrastructure Services



Source: Author.

economy, "such as pipeborne water and electrification the tasks performed by pipes and wires in the developed world are performed by women and girls—they become the *living infrastructure.* They carry water and fuel to the home and take the excrement and rubbish away with a crossing of 'clean' and 'dirty' functions—cooking food on animal excrement or preparing food after disposing of garbage" (Grieco 2002). These activities have time and opportunity costs for women and girls, for households, and for the economy at large.

The disparity in time poverty between women and men is the single most important economic factor that justifies integrating gender equity into rural infrastructure policies, programs, and projects. Because of the greater time burden linked to the tasks traditionally assigned to women, rural infrastructure services facilitate time savings, which in turn increase women's productivity and leisure time, and therefore the welfare of the whole household and community. Time saved thanks to infrastructure services can be used for rest for improved health and quality of life, for girls to attend school, and for women to expand their knowledge and develop skills. Understanding the respective time endowment or time poverty of women and men linked to the roles and responsibilities assigned to women and men is critical to selecting processes that enable both women and men to access, design, or deliver infrastructure services (Blackden and Wodon 2006). Because they are important inputs to the agricultural value chain, better access to infrastructure facilities and services can also substantially improve agricultural productivity, value added, and incomes. For example, in rural Mali provision of diesel-powered multifunctional platforms that supplied not only electricity for lighting but also motive power for labor-intensive work such as agroprocessing (milling and dehusking) and pumping water resulted in considerable time saving, fostered the development of processed products, and increased women's daily earnings by $0.47.[2]

Heterogeneity and differential impact

Rural infrastructure and derived services are heterogeneous, and their specificity needs to be understood. Although they have common characteristics, and at times common institutional solutions, the provision of transport, energy, ICT, water and sanitation, and market infrastructure requires sector-specific policies, competencies, and technical solutions. An attempt to identify the differential impacts of rural infrastructure services on women and men is summarized in table 9.1; examples illustrating most of these impacts are given in the discussion that follows.

Table 9.1 How Infrastructure Services Affect Rural Populations

Type of impact	Transport	Energy	ICT	Sanitation and hygiene	Potable water	Markets[a]
Social empowerment:						
Access to administrative, financial, and technical services	√	√	√	√	√	√
Dignity	√	..	..	√	√	..
Equal voice: individual, household, community	√	√	√	√	√	√
Mobility within or outside the community	√	√	√	√	..	√
Economic empowerment:						
Income	√	√	√	..	√	√
Productivity	√	√	√	..	√	√
Time saved	√	√	√	√	√	√
Human capital development:						
Access to education	√	√	√	√	√	..
Access to health	√	√	√	√	√	√
Basic needs	..	√	..	√	√	√
Leisure	√	√	√	..	..	√
Risks and vulnerabilities:						
Security	√	√	√	√	√	√

Source: Author.
Note: A check mark indicates the contribution of the sector to a specific impact. .. indicates no or limited contribution.
[a]Discussed in Module 5.

Conjunctive development

The provision of one type of rural infrastructure and its derived services may not suffice to achieve the expected benefits of human capital development or social or economic empowerment; the complementary development of several infrastructure services may be needed. For example, it may not be sufficient to improve the transport infrastructure and services to facilitate access to schools and administrative services, because separate latrines for men and boys and women and girls also need to be provided. In addition, men and women teachers or administrative staff need to be available or trained to address women's and men's needs. The Peru Rural Infrastructure Program is a good example of such a multiple infrastructure development approach (see Innovative Activity Profile 1).

Complementarity and sequencing of infrastructure interventions

Integrating gender equity may entail different *sequencing* of rural infrastructure interventions from gender-indifferent approaches. For example, improving household fuel supplies first rather than starting first with electrification, which is not as high of a priority for women, might lead to higher welfare and economic benefits to the household and to the whole community. Similarly, improving the water supply and sanitation to benefit women first might yield greater returns than starting with the improvement of an access road to a main market. These questions need to be raised and debated at the time of program or project formulation and design through consultations with the various groups in the community.

Finally, it must be recognized that issues of social empowerment of both women and men, quality of life improvements, and human capital development are *preconditions* for the economic empowerment to be generated by rural infrastructure services, be it at the individual, household, or community level. This has implications both for the design of project processes and for the sequencing of infrastructure interventions. For example, unless processes are in place to facilitate the social empowerment and human development of both genders first, the economic outcomes are not likely to be gender equitable.

GENDER-EQUITABLE SOCIAL EMPOWERMENT

Given the wide range of women's and men's needs for infrastructure and infrastructure services, it is critical to ensure gender equity in the planning, decision making, and management processes lest the development of the infrastructure and services cause or aggravate gender disparities. The following sections give key issues to consider.

Gender equity in planning and decision making

Women and men rarely have an equal voice in the planning and decision making for rural infrastructure. At the household level, men most often decide alone on the priorities for the family. Men also participate predominantly in community meetings at which decisions are made on the selection of priorities for, and on the location of, infrastructure investments. As a result, it is not uncommon that water wells and adjacent washing facilities, for instance, are located in areas where women are unwilling to go, or that the road between the farmstead and the market is improved before the footpath used by women to collect water or fuelwood. Another striking illustration is the attention given to electrification versus improved woodlots or improved stoves: men favor power to listen to the radio or watch television over women's need for cooking fuels and reduced indoor air pollution. The experience of the Uruguay Rural Water Program argues that women's involvement in decision making increased the viability of the rural water program by locating and designing the new water facilities to reflect women's needs. It also increased women's social empowerment through their participation in water association boards (Sotomayor 2007).

Gender equity in access to rural infrastructure assets

Experience from projects suggests that the equitable enhancement of women's and men's social capital is not automatic; it depends upon whether the design and placement of infrastructure was explicitly designed to develop social capital. For example, the Peru Rural Roads Program worked with men and women of the Andean region to improve main roads and smaller roads and tracks, and it involved rural women in its design and implementation. After project completion, 77 percent of the women reported that the rehabilitated roads and tracks enabled them to travel farther, 67 percent felt that the improvements enabled them to travel more safely, and 43 percent felt that the improvements enabled them to obtain additional income. The percentage of women participating in and leading road committees has increased slowly, and the percentage of women voting in local elections, another way of having their voice heard, increased significantly (see Innovative Activity Profile 1, this Module).

Gender equity in the management of services

Women can also participate in the management of the infrastructure services. This is the case when women participate in water user associations, in road maintenance committees, or on the boards of rural power utilities. Such participation is often an opportunity for improving their self-esteem and developing their decision-making capabilities. In the Peru and Bangladesh Rural Road Projects, 20 percent of the members of the road committees that were set up were required to be women. Proactive initiatives to mandate such participation in program and project design give the best results, but the implementation of these initiatives requires sensitivity to and understanding of the local culture, economic activities, social realities, and more important, it requires trust (Sotomayor 2007).

RURAL INFRASTRUCTURE AND GENDER EQUITABLE ECONOMIC EMPOWERMENT

Rural infrastructure and derived infrastructure services are essential for the economic empowerment of the rural population through access to key markets: financial, labor, and product markets, as well as other services that contribute to improving the value chain, especially information and training and administrative and legal services. Ensuring gender-equitable access to all these economic opportunities is therefore essential to maximize the economic returns and development impact of rural infrastructure programs and projects. The following sections summarize selected key issues.

Gender equity in business creation

Given the range of works involved, the development of rural infrastructure and related services lends itself well to the participation of small and medium-size enterprises. Although the majority of such enterprises continue to be owned, managed, and staffed mostly with men, recent efforts to integrate women in the development of such businesses has given very positive results. In the Peru Rural Road Project, which set a target of 10 percent of the members of road maintenance microenterprises being women, women's participation increased from 3.5 percent in 2001 to 24 percent in 2006 (Gutiérrez 2007). Some infrastructure sectors lend themselves more easily than others to entry by women. ICT, for example, has seen extensive women's participation, especially where ICT-based enterprise creation is supported with microcredit—for example, for the purchase of a telephone, which becomes the main asset of the enterprise. However, in most countries one of the challenges facing women in creating infrastructure microenterprises is their higher rate of illiteracy and their more limited access to credit for start-ups. Women's associations are a successful alternative to individual enterprises, such as the women's energy microenterprise of Char Montaz, Bangladesh, in its early years (see Thematic Note 2).

Gender equity in employment

The construction and maintenance of rural infrastructure generate a significant demand for labor and therefore provide significant opportunities for employment and income creation for the rural population. Providing for gender equity in the labor market and ensuring equal pay are therefore essential. This is not easily achieved because of numerous constraints: women's lack of time to engage in nonagricultural activities, taboos about women engaging in certain labor markets such as road construction, and men's perceptions that women cannot handle certain "heavy tasks" or equipment such as chain saws and driving machinery even though women have always done heavy agricultural work. The integration of women in road rehabilitation programs in Liberia is a good example of how this can be accomplished. The program recruits labor at the community level and proactively encourages women to join the labor force. Some (albeit few) of the labor recruiters and road technicians are women, which facilitates demystifying the work on the road. However, as women have lower literacy rates and lack high school diplomas and formal technical skills, their participation in the labor force is still only one-quarter to one-third that of men, and men's share of the wage bill generated by these road works is three times that of women's (Lallement 2007).

Gender equity in accessing product markets

Both women and men are very active in product markets, although it appears that men predominantly procure commercial inputs (seeds, commercial fertilizers, and pesticides) and market higher-value commercial crops, whereas women tend to market lower-value traditional crops (cereals, tubers, fruit, and vegetables). Experiential evidence points to significant gender disparities in access to product markets, although this is not very well documented. These disparities are correlated to gender disparities in access to transport services; women have less access to bulk and motorized transport (see Thematic Note 2). Significant opportunities occur when women organize to market food crops and share transport costs to more distant but higher-value markets, including

cities, which in turn enables them to earn higher incomes. Similar benefits are generated when women organize to store or partially process food crops, which raises the issue of gender equity in access to storage facilities and in the availability of energy infrastructure to sustain the cold chain. This has been achieved in Senegal with string bean growers, who are predominantly women (ESMAP-GVEP 2003; see also Module 5).

Additional constraints for women to access higher-value product markets include the lack of facilities for women to stay overnight or several days, lack of child care facilities, lack of separate latrines at marketplaces, and other risks associated with their physical security. ICT services have proved effective in bringing product market information to both men and women. Women are benefiting more from ICT services because they have lesser mobility and literacy than men. In India, for example, telephony has enabled rural women to obtain direct information on the price of food crops, empowering them to better negotiate prices with middlemen.

Gender equity in accessing financial markets

Rural infrastructure services, in particular ICT, are improving gender equity in access to rural financial markets. Many factors have constrained access to commercial rural finance (lack of land titles and other collateral, distance to banks) by both men and women, but women have been at a particular disadvantage in most developing countries (see also Module 3). ICT, however, breaks some of these barriers by providing information to both women and men on requirements for obtaining credit and on managing income and savings, information that previously would have required going to a bank. In this respect, ICT saves on transport costs, helps overcome the barriers linked to illiteracy by providing auditory information, and removes the obstacle of women's inability to go to a bank because of lack of time, money for transport, or approval from their husbands. ICT also now more often enables women to make financial transactions and empowers them to develop rural businesses. A significant aspect of ICT is the facilitation of migrant remittances, on which many rural families depend (see Thematic Note 3).

Gender equity in access to labor markets

Improving access to nonrural labor markets is critical to improving rural livelihoods and incomes. Rural infrastructure, particularly ICT and transport, is a powerful means of enabling the rural population to access nonrural labor markets. ICT services facilitate the flow of information on employment opportunities, and transport infrastructure and services facilitate the movement of people. Aspects of gender equity include ensuring that broadcast information on employment opportunities be tailored to both women and men's employment opportunities, and ensuring safe and affordable transport between urban markets and rural areas, in particular for women and girls, who are usually at greater risk of some form of harassment or violence. Well-lit bus stops have proven very effective in enabling women to safely travel to and from jobs that require periodic shuttling to and from the village, such as housekeeping jobs in South Africa or textile factory work in Bangladesh (see also Module 8).

Gender equity in accessing other services

Access to social services, not only schools and health facilities but also administrative services (civil and land registration, legal services), is also highly dependent on the availability, reliability, and cost of rural infrastructure services. Transport infrastructure and services are possibly the most important to facilitate geographical access, but one must also consider whether the on-site infrastructure of these other services caters to the respective needs of women and men (for example, whether there are separate toilets or waiting rooms).

GENDER-EQUITABLE HUMAN DEVELOPMENT

All rural infrastructure and derived services affect human development, albeit to different degrees. Understanding these impacts is critical to gauging the potential economic impact of infrastructure. If rural populations are in poor health, uninformed, or uneducated, they are unable to take advantage of the benefits that other infrastructure services can provide. The following sections summarize five key variable impacts.

Basic needs

Potable water and energy are the two most important infrastructure services for human survival. The importance of potable water is easily illustrated by the UNICEF (2006) report "Progress for Children: A Report Card on Water and Sanitation," which found that 88 percent of the deaths of children under age five from diarrheal diseases are caused by unsafe water (combined with poor sanitation and lack of hygiene). This is equivalent to about 4,000 children under five dying every day. By contrast, it is not yet sufficiently well known that 95 percent of basic staple foods must be cooked

to be transformed into human energy (DFID 2002); as a result, energy services are not yet recognized among the Millennium Development Goals (MDGs) for poverty eradication. The gender dimension of these services relates to the primary role traditionally assigned to rural women and girls for the collection of water and fuelwood, child care, and family cooking and to the time use, drudgery, and health effects of the related tasks. Both genders equally benefit or suffer from the availability or quality of water and fuel supplies.

Access to information

ICT provides information and access to product markets, credit, and other information that permit rural communities and households to integrate into the local, regional, national, and world economies. In rural areas ICTs are crucial for economic and social development and, when used appropriately, provide a platform for communities to debate and to advocate for issues important to them. In many rural areas the shortwave radio becomes the community telephone, making announcements and conveying messages between dispersed community members. It also serves as the early warning system for emergencies.

Access to health

The link between rural infrastructure and health is very strong. The impact of sanitation, hygiene, and potable water on human health is well documented and accepted. In recent years researchers have recognized the significant health effects of indoor air pollution (IAP) caused by the burning of traditional biomass fuels (wood, charcoal, animal dung) and other smoky fuels (coal, kerosene). In 2000 premature deaths from IAP were estimated by the World Health Organization at 1.6 million people, accounting for 3 percent of the global burden of disease. In some countries IAP is the second- or third-leading cause of disease. It is responsible for a range of respiratory and other diseases among the 3 billion people who still rely on traditional fuels and burning methods for heating and cooking. Women and young children are disproportionately affected by IAP, again because of the role assigned to them by society for cooking and child care. The 2000–01 Uganda Domestic Household Survey data indicate that children aged 6 to 11 months experienced a rate of symptoms of acute respiratory infections of 33 percent (Blackden 2006).

Access to transport to emergency obstetrical care can reduce maternal and newborn mortality and reduce the loss of productive capacity. Improved paths to water points or fuelwood locations can save women's and girls' hardship and time. Nonmotorized transport alleviates women's and men's carrying burdens and can contribute to reducing bone and muscular diseases. ICT is used more and more often to provide rural health services, in particular for diagnostic work, and in more advanced rural settings for supervised surgical treatment (Infodev 2006).

Access to education

Energy, transport, and ICT are three key rural infrastructure services for improving access to education. Schools equipped with lighting and power are more effective, and when they incorporate ICT infrastructure they can benefit from accessing educational information from around the world (Lallement and Siegel 2002). ICT also can provide further teacher training and can enable rural students, girls in particular, to pursue secondary school education. Radio is a critical source of information and means of lifelong learning. Lighting in teachers' homes improves security and the retention of teachers in rural areas, especially women teachers. Children from electricity-lit homes versus those from homes with candles or kerosene lamps gain two to three years compared to their peers (ESMAP 2001). Girls benefit most because their household chores usually occupy the hours of daylight after school.

Access to leisure

The time saved thanks to rural infrastructure services, in particular from energy and transport, is reallocated by rural people for productive activities or leisure. Asymmetries in time poverty by gender are well documented. For example, in Uganda, if woodlots were within 30 minutes of the homestead and if the water source were within 400 meters, households would save more than 900 hours each year, with the benefits going primarily to women and girls. This is close to 0.5 person-years of work (Barwell 1996).

Radio is often perceived primarily as a source of leisure for men. In reality, rural radio is a communication tool that can benefit both women and men with information and education, and it can be listened to while people work. Many health education and agricultural radio programs are targeted toward rural people.

RISKS AND VULNERABILITIES

The development of rural infrastructure is not without risks and vulnerabilities, and it is important to be aware of how these risks and vulnerabilities affect men and women

differently. The following issues should be taken into account in the development of rural infrastructure initiatives:

Security

Rural infrastructure services enhance the security of households and communities in many ways. In November 2007, when a cyclone hit the most remote areas of Bangladesh, the solar power and telephone infrastructure enabled authorities to activate warning systems and deploy emergency assistance within less than 24 hours. However, various infrastructure services do have gender-differentiated effects. Where roads are in poor condition and road transport is limited, pregnant women hesitate to go to the clinic for delivery for fear of dying on the way (Potgieter, Pillay, and Rama 2006). For women and girls, the risks of rape and harassment are reduced when safe basic sanitation is provided close to their households and when paths to water sources and woodlots are improved and maintained.

It is also critical to be aware of increased risks in some areas and to provide the needed education, information, and government regulation. For example, accidents occur with the improper use of bottles of liquid propane gas. Acid from discarded batteries has been used for violence against women. Although ICT has facilitated labor movements, it has also led to increased labor-trade misconduct and human rights violations (a key issue for household employees from East and South Asia who migrate to the Middle East without any social protection). Transport infrastructure can also bring risk. Improvements in rural roads can lead to increases in the number of injuries and fatalities related to transportation (see Thematic Note 2).

HIV and AIDS

Transport, mobility, and gender inequality increase the spread of HIV and AIDS, which along with other infectious diseases, follow transport and construction workers on transport networks and other infrastructure into rural areas, causing serious economic impacts. The evidence overall of risk-taking behavior by transport workers, and their relatively higher HIV and AIDS prevalence rate compared to the general population, is overwhelming (see Thematic Note 1). The World Bank requires that bidders for construction contracts in the transport sector provide HIV and AIDS education for their workforce and supply free condoms; this is best practice and should be implemented in all sectors and infrastructure development assistance programs.

Resettlement and displacement

Women, children, and the elderly are most negatively affected by loss of land or access to income resources from land due to displacement or resettlement for transport and other infrastructure. Payment of resettlement compensation to those with legal title is intrinsically gender biased because land and property are usually registered in men's names. Women are usually excluded from receiving compensation. Furthermore, they see their dependency on men increase because of the loss of income from common property resources, and changes in resource use patterns increase their workload to collect fuelwood and water. Widows and deserted women when displaced are particularly vulnerable. Displacement and resettlement often lead to the breakdown of community networks, destroying an important source of help for women in hard times (see Thematic Note 1).

The rural-urban divide

With increasing urbanization, the competition between rural and urban residents for scarce resources and services is increasing. This is already an acute problem in many dry areas. For example, to provide Chennai, India, with water, a fleet of over 13,000 water tankers plies between the rural sources and the city. Private trucks collect water from farms and villages, where wells are the main source, competing with village women for the resource, with little attention paid to the added time burden waiting for their turn.[3] Many areas face similar problems supplying fuelwood and charcoal for cities. Programs for rural infrastructure services such as water and energy, therefore, need to take a more comprehensive approach and assess the risks inherent to the competition with urban demands, as well as the potential gender impact. The Household Energy Project in Hyderabad, India, is a good illustration of how a comprehensive rural-urban household energy policy that includes both traditional biomass fuels and fuel switching can be designed and implemented, with a positive impact on the supply of energy services and on women, in both rural and urban areas (ESMAP 1999).

Environmental degradation and climate change

For many years the effects of environmental degradation on rural infrastructure services have been focal points for policy makers and development practitioners. Environmental degradation can have significant gender impacts, such as an increase in women's time burden. In the hill villages of

Nepal, where women perform 82 percent of the firewood collection, extensive deforestation increases the time they take to complete this task by 75 percent per load of firewood. For women in deforested areas, this translates to an additional 1.13 hour each day collecting firewood (Kumar and Hotchkiss 1988). On the Central Plateau in Burkina Faso, where population density is high, women spend between 32 and 35 hours each week collecting firewood (Monimart 1989 in Saito, Mekonnen, and Spurling 1994). Studies in Pakistan find that as women's access to potable water deteriorates, their time spent collecting water increases (Ilahi and Grimard 2000). Many programs have aimed at addressing these issues with the rural communities. For example, the Village Land Management Program in Burkina Faso has implemented large-scale land, water, and biomass conservation measures for over 15 years.

Awareness of the impact of climate change on rural infrastructure is increasing, especially in disaster-prone areas, such as the lowlands of Bangladesh. The reforestation of coastal areas and the construction of dikes are deemed to have lessened the impact of the November 2007 cyclone. In these areas the majority of solar home systems withstood the cyclone well because they are designed to be quickly dismounted, and the warning systems gave owners the time to dismount them. Risk assessment and management will need to play a greater role in the design and management of rural infrastructure, which will require the training of infrastructure engineers. A recent study in Canada documented that fewer than 50 percent of water, transport, energy, and construction engineers strongly agreed that climate change considerations would affect their engineering decisions in the near future. More than 80 percent agreed they needed more information to understand the various aspects of climate change (Canada Standards Association 2007) (see also Module 10).

PRACTICAL ISSUES FOR INTEGRATING GENDER INTO POLICIES, PROGRAMS, AND PROJECTS

Gender equity is a matter of development effectiveness and should therefore be addressed throughout the project cycle. Numerous factors facilitate and ensure systematic analysis and adequate responses to gender concerns in rural infrastructure projects. These factors for incorporating best practices can be summarized as follows:

- Adopt well-defined donor and government gender-equity policies with adequate political and bureaucratic support to ensure the proper analysis of gender-equitable outcomes of rural infrastructure programs.
- Use gender audits and gender budgets to identify gaps in gender balance and to analyze infrastructure budget allocations to monitor who is benefiting from services. These tools also help increase accountability and transparency.
- Use participatory approaches consistently throughout the policy formulation and project cycle to design, implement, supervise, and evaluate the gender-disaggregated effects of investments. Such approaches are critical to build ownership of the policies and programs.
- Include gender and poverty issues in project objectives and design to prevent marginalization or delays in the implementation of special activities, which are essential for analyzing and addressing gender and poverty concerns. Identify well-defined targets that can be achieved through step-by-step progress.
- Address women's time poverty with appropriate labor- and time-saving technology. Investment aimed at reducing the domestic burden of women, given the effect on productivity and labor, will substantially increase the benefits of other investments. For the energy sector, improving traditional fuel use (through fuel-efficient stoves and alternative fuels) is important.
- Include labor and business opportunities for women and men during project implementation so that they can equally benefit from the market expansion resulting from rural infrastructure programs.
- Include gender-sensitive experts in all design and review teams to ensure that both women and men are equally consulted and that the relevant components can be reviewed carefully and the necessary revisions proposed. Structure capacity-building opportunities for project stakeholders (team members and other partners) to promote ownership and commitment to the objectives of gender equity in rural infrastructure as a matter of development effectiveness for achieving the goals of improved agricultural livelihoods.
- Use gender-disaggregated monitoring and evaluation indicators to measure gender equity in all aspects of policy, program, and project implementation and outcomes. To do so, use available tools, such as household surveys and sectoral surveys. When routine measures do not exist or are not sex disaggregated, it is important to assist in building systems that do so.

Addressing gender and poverty concerns and improving rural livelihoods necessitate changes in how business is conducted. Achieving any degree of success in processes for policy, program, and project design, implementation, and monitoring and evaluation requires more time and resources and

relevant institutional changes. Furthermore, it is important to continue action-research by learning as experience is gained.

MONITORING AND EVALUATION

Specific indicators relevant to transport are mentioned in the Thematic Notes, but some general indicators are provided in Table 9.2 regarding rural infrastructure as examples of issues that should be monitored.

Depending on the country or region, it may be relevant also to consider ethnicity and caste alongside gender (both as comparative indicators and when collecting data), because women of lower castes or ethnic minorities are usually in the most disadvantaged situation.

Table 9.2 Monitoring and Evaluation Indicators for Gender and Rural Infrastructure

Indicator	Sources of verification and tools
Active participation by women and men in infrastructure planning and siting, and decision making regarding levels of local contribution	• Community meeting minutes • Project records
Functioning participatory monitoring and evaluation system recording community involvement in planning, construction, and monitoring of rural infrastructure, including gender-disaggregated data	• Community meeting minutes • Records of interviews • Records of monitoring visits by community monitors and follow-up
Number of women and men trained and participating in user groups and operations and management committees (including bank account signatory roles)	• Bank records • Committee meeting minutes • Interviews with stakeholders • Local traditional authorities (such as a chief or local council) • Program and project records
Participation in training in specific construction skills, disaggregated by gender and age	• Training records
Employment in infrastructure construction, disaggregated by gender, age, and ethnicity	• Infrastructure committee records • Local contractor administrative records
Differences in wage and employment conditions, if any, between women and other disadvantaged groups, and men for positions of comparable content and responsibility	• Case studies • Labor audits • Project management information system or administrative records
Changes in percentage of women in local maintenance crews, before and after program activities	• Infrastructure maintenance committees and user group maintenance records • Local contractor administrative records
Restoration or replacement of livelihoods of affected people (including women and ethnic minorities) following resettlement, including measurement of number of households or persons affected; extent of loss, and replacement of homesteads and agricultural lands	• Case studies • Census • Community monitoring committees • Project management information system • Resettlement plans: existence and monitoring • Sample surveys
Changes to livelihood sources (on-farm and nonfarm employment) among resettled men, women (especially woman-headed households), and other disadvantaged groups	• Case studies • Community monitoring committees • Participatory rural appraisal (PRA) • Sample surveys
Access to services and facilities (irrigation, electrification, water supply, and sanitation), disaggregated by gender and ethnicity	• Administrative records • Infrastructure maintenance committees/user group records/PRA • Sample surveys
Satisfaction levels with water allocation among various users (such as irrigation and domestic water supply), disaggregated by gender	• Focus groups • Sample surveys
Satisfaction levels among community with quality and usefulness of infrastructure constructed, disaggregated by gender and age	• Focus groups • Stakeholder interviews • User surveys

(Table continues on the following page)

Table 9.2 Monitoring and Evaluation Indicators for Gender and Rural Infrastructure (*continued*)

Indicator	Sources of verification and tools
Time spent or distance walked by household members to collect potable water, disaggregated by gender and age	• Household surveys • PRA
Percentage of time spent daily in household on paid and nonpaid activities, disaggregated by gender and age	• Gender analysis • Time use studies
Age of school leaving, disaggregated by gender	• School records
Access to public and private sanitation, before and after project activities, disaggregated by gender	• PRA • Sample surveys
Uptake of new technologies such as low-fuel stoves, pumps, new forms of transport, and use of ICT, disaggregated by gender and education level	• Sample surveys • Stakeholder interviews
Changes to transport, handling, and storage costs for disadvantaged groups involved in marketing surplus produce, measured by cost or time spent in marketing, before and after infrastructure construction	• Case studies • Sample surveys
Number of women and men participating in training on higher-value crop production or small enterprise development	• Training records
Number of women and men receiving training in ICT	• Training records
Percentage of women and men in community using computers and the Internet, and the frequency of use	• Computer center and Internet café records • Stakeholder interviews
Changes over *x*-year period of project activities in household nutrition, health, education, vulnerability to violence, and happiness, disaggregated by gender	• Household surveys, before and after • Project management information system • School records
Spread of HIV and AIDS, prostitution, alcoholism, and other problems from in-migrant workers involved in rural infrastructure construction or using roads, compared with baseline, disaggregated by gender	• Community health surveillance • Health records • Local authority reports

Source: Authors, with inputs from Pamela White, author of Module 16.

THEMATIC NOTE 1

Rural Transport

Rural transport contributes to rural livelihoods by increasing the mobility of people and goods and facilitating access to resources that serve basic needs as well as labor and commodity markets, services (health, education, and financial), and information. Rural transport infrastructure often opens the way for the development of water, energy, and other infrastructure. Rural transport includes motorized and nonmotorized rural transport services for passengers and freight (such as public and private trucks, buses, trains, and boats as well as bicycles, animals, and other intermediate means of transport) and rural transport infrastructure (rural roads, bridges, tracks, trails, paths, and waterways).

The rapid growth of urban centers and periurban sprawl in developing countries has blurred the boundaries of rural and urban and increased nonfarm income opportunities for rural men and women. The globalization of food production, distribution, and retailing based on integrated global value chains and the adoption of high-value agricultural export production (for example, flowers, tropical fruit, and vegetables) in many developing countries, facilitated by transport linking paths and roads to airports and railroads, have increased options for women and men in labor-intensive crop production and processing (Barrientos, Kabeer, and Hossain 2004; Dolan and Sorby 2003).

Conventional rural transport planning has focused on road networks and the long-distance transport of produce, neglecting transport solutions for the many rural women and men who lack access to motorized transport and travel by foot on feeder roads, foot bridges, and tracks. Upgrading a rural road can increase the flow of motorized traffic without directly benefiting local rural people and often creates safety risks for them. There are conflicting local and through-traffic needs and impacts for national and state highways that pass through rural villages. Local people want safety and access; pass-through travelers want rapid traffic flow (Tiwari 2001). A road investment alone does not guarantee that adequate transport services will meet the needs of local women and men, particularly in areas with low population density (Plessis-Fraissard 2007; World Bank n.d.).

Although recognition is growing that transport can make significant contributions to achieving the MDGs and extensive research has been conducted on gender differentials in access, mobility, and patterns of rural transport use, as well as many successful transport pilots and activities that address women's needs and priorities, the integration of gender and other social dimensions has not become an established part of doing business in the rural transport sector. Many decision makers still assume that transport is "gender neutral," that is, it benefits men and women equally. Rural transport policy rarely incorporates national gender policies or social and gender assessments. Conversely, country gender assessments and strategies seldom address infrastructure issues.

A rural livelihoods approach to transport planning goes beyond conventional cost-benefit analysis to examine environmental and social impacts as well as gender disparities. Transport is approached in the wider context of individual, household, and community development, as a *means* of enhancing rural economic growth and reducing poverty and responding to women's and men's needs, not an end in itself (Fouracre 2001; Starkey and others 2003).

KEY GENDER ISSUES

Gender inequality is now recognized as a serious obstacle to poverty reduction and economic growth, particularly in rural areas where women play significant roles in agriculture and food security (World Bank 2001). In most instances rural women have more limited access to land, labor, financial, and product markets (agricultural inputs and outputs). Women have more limited opportunities than

their men counterparts to secure employment outside of agriculture, to increase nonfarm income, and to access education, training, and transportation services that will facilitate their livelihood (both domestic and income earning). They have fewer assets with which to pursue their livelihood strategies and have more vulnerabilities. This affects women's mobility, access, and transportation needs and results in gender differences in the impact of transport interventions (Graeco 2002; Peters 2002).

Gender inequality in transport burdens

Transport takes up a large amount of time and physical effort in rural areas, and women bear most of that burden[1] Rural men and women play multiple roles (productive, reproductive, and community management), but men generally are able to focus on a single productive role and play their other roles sequentially. Because rural women need to play these roles simultaneously and balance competing claims on limited time, women's labor time and flexibility are much more constrained and inelastic than men's. In addition to their prominence in agriculture and the informal sector, women and girls bear nearly all of the "invisible" domestic tasks of processing food crops, providing firewood and water, and caring for the elderly and the sick. Women's heavy domestic burden limits the time they can spend on economic activities and restricts them to activities compatible with domestic responsibilities. Thus, rural women face trade-offs in time allocation between different productive activities, between market and household tasks, and between meeting short-term economic and household needs and long-term investment in capacity and human capital. Women's time poverty and income poverty often reinforce each other with negative impacts. As long as the household economy is invisible, rural transport policy makers and planners are unlikely to attempt to address the trade-offs among different productive and domestic tasks (Blackden 2003; Blackden and Wodon 2006; Quisumbing 2003; World Bank n.d.).

For example, a UNDP time allocation study in Benin found that women worked 67.2 hours per week and men worked 50 hours. Men spent 24 hours on production, and women spent 17.5. Women spent 9.6 hours gathering wood and water, whereas men spent only 1.4 hour. Women spent 13.3 hours processing agricultural products and preparing meals; men spent 1 hour (Blackden 2003). In Zimbabwe, in an average family of six persons, 90 percent of the transport burden is headloaded, primarily by women. Women and girls collect and carry 95 percent of the water for household use and 85 to 90 percent of the fuelwood (Tichagwa 2000). In areas where water or firewood is scarce, this time and effort can be substantially more. In Tanzania Masaai women walk up to 30 kilometers to the next water hole during the dry season (World Bank n.d.).

Headloading and backloading transport activity has direct costs in human energy and time as well as health and opportunity costs. Headloading adds an estimated 20 percent to women's travel time. Women's heavy transport burden reduces their agricultural productivity, diminishes their ability to grow and market cash crops, and limits their access to farm and nonfarm employment as well as local community decision making. Headloading also causes back and neck injuries (Peters 2002).

Gender differentials in access to transport

In many developing countries men's control of household cash and intermediate means of transport (IMTs), such as draft animals, bicycles, and carts, and social and cultural constraints on women's mobility limit women's access to transport opportunities that could reduce their transport burdens (Edmonds 1998). Men's control also creates differential access to markets, inputs, training, extension services, grain mills, and financial and health services for women and men. A multidonor report, "Can Africa Claim the 21st Century?" concluded that in Tanzania reducing time burdens of women could increase household cash incomes for smallholder coffee and banana growers by 10 percent, labor productivity by 15 percent, and capital productivity by 44 percent; in Kenya, giving women farmers the same level of agricultural inputs and education as men could increase yields obtained by women by more than 20 percent (World Bank 2000).

Rural transport services are often infrequent and expensive. Schedules and frequency of service are based on peak periods of travel to and from work rather than the multiple travel tasks of women who often "trip-chain," combining various domestic and caretaking responsibilities with wage-earning trips that occur throughout the day when services are limited (Peters 2002). The high cost of providing transport in areas with low population density often translates into high tariffs unless government subsidies are provided to service operators and users. Many rural men and most rural women lack the resources to pay these tariffs or to purchase intermediate means of transport. Thus, if the distance is too great to headload crops to market, farmers must sell to middlemen, who take a large share of the profit. For women and men who can afford rural transport services, only limited amounts of produce can be accommodated,

making the transport costs high in relation to profits from sales (Plessis-Fraissard 2007).

Limited access to transport has serious human costs as well. Every minute around the world a woman dies in childbirth, and most of these deaths are preventable. Transportation delay to emergency obstetrical care because of lack of roads, transport services, and money to pay for transport is one of three types of delays that can lead to medical complications, including obstetric fistula,[2] which can result in maternal and newborn deaths (Babinard and Roberts 2006; Riverson and others 2005). These losses reduce labor and production capacity and threaten family welfare.

Unequal access to rural transport-related employment and income

Employment in rural transport that is dominated by men includes construction labor; provision of public or private transport services, such as driving and maintaining buses, trucks, and cars; and work in public sector institutions that plan for and manage transport services. Barriers to rural women's access to transport jobs and enterprises include information networks that bypass women, perceptions of "appropriate" work for women, differential pay rates for women and men, and gender inequalities in access to schooling that leave women without the necessary qualifications (Lallement 2007; SIDA 1997). Although labor-based construction has provided an entry point for women, even projects with gender inclusion provisions face serious challenges in institutionalizing these approaches (Tanzarn and others 2007). Redundancy resulting from privatization of transport services is also gender differentiated; women are almost universally the first to lose jobs.

Inadequate safety and security measures

Safety and security issues are seldom adequately addressed in rural transport projects even though increased road connectivity also brings increased injuries and deaths, most often among the poorest. Pedestrians with headloads, nonmotorized transport, and motorized vehicles move at very different paces on the same road, which often has little or no shoulder. The most vulnerable road users are pedestrians and people riding on nonmotorized vehicles and motorcycles. People living in rural areas are more likely to be killed or seriously injured if they are involved in road accidents because motor vehicles tend to travel faster there and trauma care is extremely limited (World Health Organization 2004). Men are involved in more fatal accidents than women, and women are involved in more nonfatal accidents. Less motorized countries account for 86 percent of global fatalities (TRL and DFID 2000). The economic impact of road accident fatalities and injuries represents an estimated annual $53 billion in lost production in developing countries. In India road accident costs account for an estimated 2 percent of gross domestic product (Tiwari 2001).

Rural transport services are often dangerous. Drivers speed and overload vehicles and seldom give passengers enough time to safely board or exit. Women are often harassed, and their goods are poorly handled (Plessis-Fraissard 2007). Limited transport service availability often means that rural women going to markets or to work in agroprocessing must wait for buses or trucks before dawn and return after dusk, placing them at risk for assault (Dolan and Sorby 2003).[3] In addition, the trafficking of girls and women increases with greater road connectivity, especially near major roads and in cross-border corridors. Risk is greatest where women have low status and there is widespread poverty, such as in rural Nepal (Latif 2005).

Transport, mobility, and gender inequality and the spread of HIV and AIDS

HIV and AIDS and other infectious diseases follow transport and construction workers on road and other transport networks into rural areas, causing serious economic impacts on human capital and agricultural productivity. Mobility and long absences from home make transport workers particularly vulnerable to HIV and AIDS, whether they work on land, sea, or air routes. The evidence overall of risk-taking behavior by transport workers and of their relatively higher HIV and AIDS prevalence rate compared to general populations is overwhelming (International Transport Workers Federation 2007). In regions where HIV and AIDS are entrenched, more women are now infected than men, and in countries where epidemics are just beginning, new infections among women outnumber those among men. Unequal gender relationships force millions of women, already biologically much more vulnerable to infection than men, to submit to demands for unprotected sex and prevent them from learning about the casual sexual encounters of their partners. Gender differences in risk factors, vulnerability, and the impact of HIV and AIDS have implications for prevention, care, treatment, and coping mechanisms. HIV and AIDS have been particularly devastating in sub-Saharan Africa, where women play a major role in agriculture and food security and bear the burden of care for HIV-positive family members and AIDS orphans (Cook 2003; ITF 2007; Lema and others 2003; Mutemba and Blackden 2000).

The disproportionate effect of resettlement and displacement by transport infrastructure on women

Women, children, and the elderly are most negatively affected by loss of land or access to land because of displacement or resettlement for transport and other infrastructure. Payment of resettlement compensation to those with legal title is intrinsically gender biased because land and property are usually registered in men's names. Thus, women are usually excluded from receiving compensation. Negative impacts of resettlement and displacement can include the increasing economic dependence of women on men due to the loss of their income from common property resources, the increasing vulnerability of widows and deserted women when displaced, and the added burden for women and girls due to changes in resource use patterns, particularly the loss of familiar sources of fuelwood and water. In addition, the breakdown of community networks destroys an important source of help for women in hard times (Asian Development Bank 2004; Cernea 2000).

BENEFITS OF GENDER-RESPONSIVE ACTIONS

The discussion addresses the key benefits of gender mainstreaming into rural transport projects and programs.

Increased agricultural production, economic growth, and economic empowerment

Construction and rehabilitation of feeder roads, tracks, and bridges and more affordable access to road and water transport services and intermediate means of transport increase the productivity and incomes of men and in particular women farmers who rely on them more heavily, by reducing time and opportunity costs and expanding their access to markets and inputs. For example, in Peru the rehabilitation of nonmotorized tracks in isolated communities reduced poverty from 83 percent to 74 percent, and 77 percent of the women traveled more frequently. Routine road maintenance created 6,000 jobs, 24 percent of which were held by women (World Bank 2007b). Boats carry consumer products and medicines to remote communities and serve as shops for their owners, who are often women. Floating markets are widespread in the Mekong Delta, where rural women and men also depend on water transport to take fertilizer or seed to their fields and carry the crops for consumption and sale (IFRTD 2003).

Increased infrastructure cost effectiveness, accountability, and sustainability

Participatory, gender-inclusive assessment of transport needs and transport planning identifies local needs of women and men and identifies problems and resources that can affect the outcomes of a project, thus increasing the efficiency and outcome benefits. It builds a local sense of local ownership of the road and commitment to repair and maintenance, which increases sustainability. It also reduces conflicts and tensions and thus prevents construction delays that increase costs. This process increases local-level planning capacity, accountability, and transparency in use of local resources and more gender-equitable distribution of benefits. Also, it reduces the risks of adverse effects on intended beneficiaries. Involvement of local women in rural transport planning often provides more pragmatic inputs on road selection and design that more directly reflect local economic and safety needs. For example, separate consultations with women in the Yemen Rural Access project resulted in safety features such as speed signs and speed bumps near schools. The women working on road maintenance in the Second Peru Rural Roads project improved the quality of road work because men drank less and worked more regularly with women on the team. Women were responsible for ensuring the quality of roadwork and handling payments because they were viewed as incorruptible. The economic rate of return for the project was over 30 percent (Caballero 2007; World Bank 2007b).

Increased human capital

Access to transport to emergency obstetrical care can help reduce maternal and newborn mortality and reduce the loss of productive capacity. Access to IMTs such as donkeys for carrying water and wood can reduce domestic transport time burdens and free up time for girls to attend school and for women to participate in literacy and farming and business skills training. Road access and dedicated transport services for girls can also facilitate safe access to school for girls and boys and increase school attendance. Research in Nepal, a landlocked country with severe accessibility problems, showed that road access affects girls' school enrollment more than boys'. When the school is a four-hour walk from the road, boys' enrollment is 56 percent and girls' is 31 percent. When the school is a 30-minute walk from the road, enrollment increases to 67 percent for boys and 51 percent for girls (Shyam 2007). In Morocco improved, all-weather roads increased access to butane gas for heating and cooking. This reduced women's and girls' domestic

burden and tripled girls' primary school enrollment (Levy 2004). Vietnam, a country with great dependence on water transport, uses boats to carry children to and from school (IFRTD 2003).

Reduced risks and vulnerability

Improved rural road safety—particularly for pedestrians, nonmotorized transport, and school areas—through safety education and public awareness raising, traffic management (for example, safety bumps, signs, separate paths for nonmotorized traffic), and enforcement can reduce unnecessary disabilities, injuries, and deaths that otherwise diminish rural human capacity and productivity.

Information, education, and mobilization programs linked to transport projects can raise awareness and change behavior to reduce transmission of HIV and AIDS, combat sex trafficking in rural areas where it is prevalent, and reduce harassment and gender violence on routes to school, transport to wage labor, or on paths around villages.

Equitable relocation and resettlement mitigation strategies can reconstruct the basis for rural livelihoods for women and their children through compensation transfers directly to women's bank accounts, access to communal land, livelihood training and employment opportunities, health and education facilities and services, and food security programs (Asian Development Bank 2003; Cernea 2000).

POLICY AND IMPLEMENTATION ISSUES

The sections discuss the key policy and implementation issues in gender integration into transport projects and programs.

Gender-sensitive rural transport policies

Transport policies should be informed by social and gender analysis to address rural women's and men's needs and constraints, including women's domestic labor burden. The consultation process for transport strategy development needs to engage a wide range of stakeholders, including women. The rural transport strategy needs to spell out the key institutional arrangements for the three principal areas of rural accessibility and mobility in gender-equitable terms: (1) infrastructure, (2) rural transport service, and (3) location of physical facilities such as markets, schools, and clinics (Essakali 2005; Malmberg-Calvo 1998; Starkey and others 2003).

Balancing economic efficiency, engineering standards, and socioeconomic transport needs

On the one hand, community-driven development projects are often very effective in social and gender inclusion and responding to local women's and men's needs but less effective in meeting engineering standards or cost effectiveness and may fail to link to the larger transport grid. This can result in roads that do not link to markets and that deteriorate quickly (Ishihara 2007). On the other hand, large, centrally managed rural road projects are usually technically sound and cost effective but seldom address gender and other social issues. This can result in negative impacts on local people and in poor maintenance due to lack of local sense of ownership, and in some instances conflict can delay road construction. To achieve a balance between transport social "software" and construction "hardware," transport program designers and managers need the capacity to formulate and analyze questions about the socioeconomic and gender aspects of transport requirements and the implications of transport interventions. Integrating social scientists with gender and transport expertise into rural transport project teams and transport agencies is one way to achieve this. The most effective integration of gender in transport projects has included concerted efforts to build social and gender analysis capacity and awareness in transport agencies. The Feeder Road Prioritization Approach, developed in Ghana, combines attention to women's and men's transport needs with technical rigor and cost effectiveness in a participatory process that builds local ownership (Hine, Ellis, and Done 2002).

Transport governance issues

Weak governance reduces the efficiency, sustainability, and equitable distribution of benefits of rural transport interventions, particularly for women who generally have little voice in community decision making. One common issue is exclusive, ineffective local governments that are fragmented, lack planning and coordination, and have little or no transparency and accountability. Another common issue is a lack of clarity on who (national, local, or private entity) owns and is responsible for maintenance of roads and tracks. Resolution of these issues within a gender-sensitive framework requires aggressive interventions to improve management, accountability, and equity. Rural roads need to be planned and managed as a pivotal network in the entire transport chain, a network that relates to all other modes or transport subsectors and in which women are prime movers (Graeco 2002; Rankin 1999; Starkey and others 2003).

Financing also needs to be gender sensitive and transparent, whether this includes locally raised revenues, central-to-local fiscal transfers, road maintenance funds, or donor, community, government, and road fund financing (Rankin 1999). Road funds are among the more popular forms for filling road sector financing gaps by pooling fuel taxes, tolls, and other resources under various institutional arrangements and oversight rules. The establishment of road funds has increased road maintenance funding and its stability throughout Africa. It is very important to ensure representation of women's interests on the boards that govern the road funds.

Gender-responsive monitoring and evaluation systems

Creating a gender-responsive monitoring and evaluation system requires appropriate baseline data, relevant sex-disaggregated indicators, and sustainable mechanisms for data management and evaluation. It is important to measure gender differences in social and economic impacts to determine the extent to which transport is contributing to the MDGs, equitable poverty reduction, and women's empowerment (Maramba and Bamberger 2001). Monitoring and evaluation systems are essential for guiding planning and midterm adjustments, tracking the distributional effects, establishing accountability, and ensuring commitment to achieving gender-specific priorities (see also Module 16).

GOOD PRACTICES AND LESSONS LEARNED

Recognizing significant regional and country variation in gender and rural transport issues is important, as well as the institutional frameworks in which rural transport operates. Differences must also be examined among rural women based on livelihood strategies, age, ethnic and religious affiliations, disabilities, and other factors. No one-size-fits-all solution may be found. Good practices must be adapted to respond to different and changing contexts based on social analysis that takes gender into account. Very few projects have integrated gender throughout the project. Many use innovative approaches to one or two aspects of a project, such as consultation or monitoring and evaluation.

Raising gender awareness for rural transport decision makers

Mainstreaming gender in rural transport policy, strategy, and the design and delivery of infrastructure and services requires a high level of sustained political and managerial commitment, which can be facilitated through awareness raising, using evidence of positive outcomes to foster high-level champions for gender issues in transport. The World Bank conducted regional and country-specific training for transport sector staff, including engineers, and as a result, the engineers became advocates for social dimensions of transport planning.[4] The Gender and Rural Transport Initiative (GRTI) in Africa conducted numerous training activities, such as the training for principal secretaries in Malawi (box 9.1). (See other examples of gender sensitization in Module 2.)

Accessibility planning

Optimal accessibility is crucial to reducing rural gender-based exclusion (Graeco 2002). Access is a key element in providing opportunities for economic and social development and thus an entry point for local-level planning (Edmonds 1998).[5]

Box 9.1 Malawi Forum: High-Level Officials Address Gender Imbalances in Rural Travel and Transport

The principal secretaries in Malawi have a significant impact on policy formation. On April 8, 1999, they signed the Makokola Declaration on Gender, which supports the need to integrate gender issues into all areas of development. Because transport was not explicitly mentioned, GRTI conducted a workshop to increase awareness of the gender and rural transport issues and gain the secretaries' support for needed changes. The principal secretaries developed a gender action plan for Rural Travel and Transport (RTT) with the aim to (1) ensure that the transport policy adequately addresses gender issues in the transport sector and RTT subsector, (2) build the capacity for gender analysis of gender focal points in all ministries, (3) involve gender focal points in decision making, (4) formulate an effective coordinating committee among ministries to ensure progress in gender mainstreaming, and (5) develop a project to facilitate rural women's access to IMTs through, among other things, the provision of credit facilities.

Source: Gender and Rural Transport Initiative 2002.

The Rural Access Index for roads measures the percentage of the rural population that lives within 2 kilometers of an all-season road.[6] Typically this is equivalent to a walk of 20 to 24 minutes. The World Bank Transport Sector Board has established the Rural Access Index as one of the key diagnostic measures for the sector. It is also part of the results measurement system launched for the 81 countries that receive International Development Association assistance. In the 48 countries for which the index has been calculated, only 56 percent of the population had access to an all-season road in 2006, leaving an estimated 1 billion people without access. The Rural Access Index provides a measure of the need for improved accessibility to achieve the MDGs. For example, a high correlation has been found between low access and high maternal mortality ratios as well as low school enrollment, particularly for girls (Roberts, Shyam, and Rastogi 2006).

Integrated rural accessibility planning (IRAP) is a tool developed by transport planners in the International Labour Organization for district-level integrated planning of facilities (water sources, schools, clinics, hospitals, markets, shops, woodlots, and government offices) in conjunction with roads, tracks, and other transport links. IRAP is based on mapping the location of households, facilities, and transport links, and women and men in local communities are encouraged to participate in the mapping exercise. IRAP has been successfully adopted in a range of countries in Africa and Asia (Donnges 2003). Efforts to incorporate gender issues in IRAP include analysis of the social and gender aspects of accessibility and travel patterns, origin and destination studies using sex-disaggregated data, integration of gender issues and indicators into data-collection manuals, women's representation among key informants and in community-level planning, inclusion of women's nongovernmental organizations (NGOs) in decision makers' pools, sex disaggregation of data, and use of gender indicators.[7] A geographic-information-system-based IRAP map of settlements and facilities in a district can be a powerful tool for planning. A similar approach has been adopted by the Ministry of Public Works in Lesotho (box 9.2).

Box 9.2 Lesotho: Mapping Mobility and Access in Rural Areas

A pilot project focused on the potential of using a geographic information system (GIS) and participatory digital mapping as tools to analyze differential impacts of existing and proposed infrastructure and services on access and mobility of men and women in two remote river valleys in Lesotho. Participatory mobility and access mapping was integrated into the GIS using a Global Positioning System (GPS) device. Mobility and access maps to emergency transport, health centers, schools, grinding mills, and other services were generated for men, women, children, and the elderly in different villages. Mapping and interviews revealed significant gender and locality differences in mobility patterns with implications for differential impacts of transport investments. For example, women's lack of access to IMTs results in fewer opportunities than men have to access health services in the region. Elderly women in particular are adversely affected by poor transport to access their pension payments in the district capital. The study also revealed a fragmentation of services that increases the number of trips required to access them.

Source: Walker and others 2005.

Gender-sensitive intermediate means of transport

IMTs can increase women's mobility, independence, productivity, entrepreneurship, and empowerment and reduce domestic burdens. For example, in Tamil Nadu, India, bicycles introduced in a literacy program in the 1990s have increased women's mobility, independence, and empowerment in a sustainable way. Large numbers of girls bike to school daily (Rao 2002). Bicycles with carrier baskets reduce travel time to fields and markets and increase the amount of produce or other goods that women farmers and entrepreneurs can carry.

One effective way of enhancing women's access to IMTs has been the provision of credit to women for IMT purchases. Another has been to encourage joint business ventures by women using IMTs. It is also important to work closely with women's organizations to avoid sociocultural barriers to women's access and use of IMTs and to involve community leaders (men and women) and get their support of women's use of IMTs. It is important to ensure that IMTs are designed for women's size and strength. Facilitating local production of IMTs has produced the most sustainable use in sub-Saharan Africa. Training rural women how to maintain and repair IMTs can provide entrepreneurship opportunities for women. It is also important to coordinate IMT initiatives with road design to ensure safety. IMT projects designed to benefit the entire family help ensure that women's participation does not create domestic conflict (Edmonds 1998; Peters 2002; Rankin 1999; Starkey 2001).

Multisectoral approaches

A multisectoral approach to rural transport for rural livelihoods can address key access issues and contribute to achievement of the MDGs.

Multisectoral strategies: The World Bank Africa Travel and Transport Project concluded that providing water was an important way of addressing transport needs. Africa transport programs in several countries are engaged in the preparation of integrated rural development plans that include the provision of basic services. Similarly, Economic and Sector Work on "Rural Infrastructure in Peru" recommends adopting a territorial perspective that links rural economies to surrounding towns and avoids separate sectoral interventions and provides infrastructure services with stronger links to local realities and participation (World Bank 2006).

Labor-saving technology: Nontransport interventions sometimes provide more cost-effective solutions to reducing transport burdens than transport options. Nearby access to grain mills, wells, pumps, and wood lots and the use of alternative fuels and fuel-efficient stoves can significantly reduce domestic transport burdens (Edmonds 1998; Starkey 2001). A study of time saved by use of a new water supply closer to the household found savings of 120 minutes for each household per day in Chad, 17–86 in Kenya, 60 in Lesotho, 106 in Mozambique, and 100 in Zaire. In Zambia transport efficiency more than doubled when wells were used. However, in a number of projects, the failure to involve women in planning for the source and location of new water supplies has resulted in limited or even negative impacts (Malmberg-Calvo 1994).

Fuel-efficient wood-burning stoves can also reduce transport burden. Assuming that firewood consumption and the distance to collect firewood are equal to that of the average household in the Makete, Tanzania, the time spent on firewood collection would be reduced by 73 to 145 hours per year (1.4 to 2.8 hours per week) through the use of an improved wood-burning stove. The corresponding reduction in energy would be 6 to 12.2 tonne-kilometers each year. In Asia improved stoves also reduce cooking time by 20 to 30 percent. The estimated total average annual time saving is 250 hours (4.7 hours per week) (Malmberg-Calvo 1994). (See also Module 7 and Thematic Note 4.)

Rural markets: Increasing the density of rural markets reduces transport time and cost and increases market access, particularly for women, given their domestic burden and limited resources. Efficient, affordable transport services and access to IMTs can also lower the time and cost required to get to markets and reduce postharvest loss (Starkey and others 2003). The Bangladesh Second Rural Roads and Markets Project combines these benefits with women's empowerment outcomes (box 9.3). (See also Module 5 and Thematic Note 1.)

Transport employment and enterprises: Inclusive employment policies in labor-based construction, repair and maintenance, and other transport employment with fair wages can increase economic and social empowerment, particularly for women. Targets and contract requirements with specific clauses in bidding documents for construc-

Box 9.3 Bangladesh: Second Rural Roads and Markets Project

The Bangladesh Second Rural Roads and Market Project (1996–2003) provided women the opportunity to access labor, product, and financial markets for their own economic empowerment, where previously women had to remain within their households without any income. A social and gender assessment revealed a demand for mechanisms to provide women access to labor and product markets, equal wages, participation, and decision making. In response, the project reserved 30 percent of the road construction jobs, 30 percent of the market management committee positions, 30 percent of the shops, and 100 percent of the tree plantation and maintenance work for women. The project also facilitated the formation of women's contracting societies, traders' associations, self-help groups with savings and revolving loan funds, and microenterprises for road rehabilitation. Partnerships were established with local government institutions for scaling up and strengthening the activities. Gender was also mainstreamed in the government agency to ensure sustainability after the completion of the project and to scale up the approach in other sectors, such as water management, urban development, and flood protection. There was a 50 percent increase in women's employment and equal wages. Girls' and boys' enrollment in schools has increased dramatically as well. The World Bank, Asian Development Bank, U.K. Department for International Development, and German Gesellschaft für Technische Zusammenarbeit have scaled up this approach to cover the entire country.

Sources: Ahmad 2007; Pulley, Lateef, and Begum 2003.

tion companies addressing equal opportunities for women combined with accountability through monitoring and evaluation are generally needed to ensure that women are hired and are paid equal wages. For example, contractors for the World Bank Mozambique Rural Roads and Bridges project are required to hire 100 percent local labor, 25 percent of which must be women. They are also required to provide HIV and AIDS awareness raising, testing, and treatment for men and women construction workers and communities near the roads.

Grants and access to reasonable credit may be needed to enable poor women and men to establish transport-related enterprises. For example, rural road rehabilitation and maintenance projects in Bangladesh, Mozambique, and Peru set quotas for women's employment. In Peru it was necessary to modify the criteria for participation in roadwork, to accept women's agricultural experience as relevant for the road tasks. The projects in Bangladesh and Peru also provided road-rehabilitation skills training. In Peru women's participation in road work increased from 3.5 percent in 2001 to 24 percent in 2006 (Ahmad 2007; Caballero 2007). These projects enabled illiterate women to become entrepreneurs, establish businesses, and earn income for the first time.

Emergency medical transport: Motorcycle ambulances have been operating in several African countries since 1998 to reduce delay in access to emergency care. The largest number of these is in eastern South Africa with a dozen units each covering a 50-kilometer radius. (Babinard and Roberts 2006). Ethiopia's transport agency is planning innovative pilots, such as the introduction of emergency access cards, to enable the rapid transport of women in obstructed labor to the nearest capable health facility. Work with NGOs, the Red Cross, and technical schools will introduce IMTs to help transport emergency patients. Communities will receive tools for labor-based construction activities, including culvert and bridge construction and maintenance, to help ensure year-round access for emergency transport. These transport activities will complement health and social activities (Clarke 2007; Riverson and others 2005). In Vietnam boats serve as water ambulances (IFRTD 2003).

Information and communication technology for transport: The rapid expansion of mobile telephones in developing countries can facilitate road improvement schemes and efficient use of transport services. ICT can enable pooling of resources among a wider set of communities in joint operation of a vehicle or vehicles and enables multi-use of public transport facilities (Graeco 2002; Starkey and others 2003). It also provides a means of coordinating access to emergency obstetrical care, accessing information on market prices, and conducting business. A project in Sierra Leone provided radios to summon vehicles to take women to hospitals. Another project in Uganda provided VHF radios and walkie-talkies to health posts, ambulances, medical officer vehicles, traditional birth attendants, and midwives to improve the referral system (Babinard and Roberts 2006).

HIV and AIDS prevention: Contract clauses on HIV and AIDS prevention and treatment for construction contracts were proposed by World Bank engineers in the Africa region as a practical approach to address the increased incidence of HIV and AIDS where roads were constructed. These contract requirements are now applied in the general health and safety conditions in standard bidding documents of major works contracts (more than $10 million) under World Bank lending projects for transport. The Asian Development Bank has similar requirements.

The Western Africa HIV and AIDS project for the Abidjan-Lagos transport corridor aims to increase access to HIV and AIDS prevention, treatment, support, and care services for underserved vulnerable groups (truck drivers, women traders, and sex workers). The project distributes information about HIV and AIDs as well as condoms for men and women, trains health officers, and promotes free movement of people and goods by reducing cumbersome border-crossing procedures. The project informs women traders of their rights and the documentation required for crossing borders to avoid harassment at border checkpoints. It also trains women sex workers about HIV and AIDS prevention; provides free condoms; and gives financial grants to help them find alternative employment. The project also helps strengthen women's organizations' capacity-raising awareness of the rights and needs of people living with HIV and AIDS (World Bank 2007a).

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

The following guidelines provide crucial actions needed to increase development effectiveness and sustainability of rural transport infrastructure and services by taking into account the different constraints, opportunities, and needs of women and men and engaging them in the entire development process. Monitoring and evaluation of investment outcomes and impacts using sex-disaggregated beneficiary indicators and gender indicators of progress toward gender equality are also essential (box 9.4).

Box 9.4 Examples of Gender-Sensitive Rural Transport Results Indicators

Access

- Increased number of women and men within two kilometers of an all-weather road
- Reduced time required for transfer of a woman with obstructed labor to emergency care
- Reduced time required for girls and boys to travel to school
- Increased school enrollment and completion for girls and boys
- Women's and men's access to IMT for agriculture and domestic tasks

Employment and entrepreneurship

- Number of women and men employed in transport construction, transport services, and government transport agencies
- Number of men and women operating transport-related services

Income

- Increased women's and men's income from produce marketed using transport services
- Increased women's and men's income from transport employment and enterprises

Time

- Women's and men's time reduced for domestic transport tasks (water, fuelwood, food crop collection, food processing)
- Women's and men's time reduced for marketing transport tasks
- Women's and men's time reduced for travel to non-farm employment

Affordability

- Percentage of income spent by women and men on transport tariffs

Voice in transport decision making

- Number of women and men participating in road committees
- Number of women and men leading road committees
- Number of women and men managers in rural transport agencies

Sources: Kunieda and Gauthier 2007; Maramba and Bamberger 2001; Rankin 1999.

Policy dialogue:

- Increase awareness of government officials and communities that rural transport policies and projects are not gender neutral and specific interventions are needed to ensure that women benefit.
- Ensure that rural transport policy and strategy are owned by the beneficiaries through participatory planning, implementation, and monitoring and evaluation that includes women as well as men.
- Inform rural transport policies, strategies, projects, and project adjustments with social and gender analysis. It is essential to understand and address gender differences in transport needs, constraints, and potential impacts.
- Ensure that adequate human and financial resources are allocated to addressing gender and other social dimensions of rural transport at institutional, community, and project levels.

Operations:

- Embed transport-knowledgeable social or gender staff in the implementing agency with terms of reference that include gender integration. The gender sensitivity of the implementing agency is a critical factor in achieving positive outcomes.
- Develop gender action plans as roadmaps for integrating gender in transport projects. Developing a gender action plan with stakeholder participation ensures community and institutional support and accountability for the implementation of the activities.
- Use gender-inclusive mechanisms. Participatory approaches do not automatically include women. Mechanisms are needed to increase women's participation, such as inclusive consultations with women by women, quotas for road construction and road committees, outreach and mobilization, socially responsible contract clauses, formation

of women producers and processors groups, and training for women to level the playing field with men in transport work.

- Work with local women's organizations, NGOs, and networks. NGOs with strong institutional capacity and a government willing to partner with NGOs can mobilize local support, increase women's participation and decision making, and provide training. Not all NGOs have the human, organizational, or financial capacity to provide the necessary assistance.
- Provide awareness raising and technical assistance on gender and other social dimensions of rural transport at all levels.
- Use gender-sensitive results-based monitoring and evaluation to guide rural transport planning and investment, as well as supervision of project implementation and impact evaluation. Gendered measures of impact need to be integrated into specific and routine monitoring processes, such as passenger and household surveys on transport issues. All routine measures related to beneficiaries should be disaggregated by sex and, where appropriate, age and other social characteristics. Where routine measures are not established or sex disaggregated, these need to be developed to assist in building the systems and capacity needed for routine application.

THEMATIC NOTE 2

Energy

Taking into consideration men's and women's different constraints, needs, and potential contributions when designing rural energy policies, programs, and projects can significantly enhance economic and social development in rural areas and promote the sustainability of rural energy investments and services. At present, about 2 billion people do not have access to electricity for lighting and power, and 3 billion rely on traditional biomass for their basic cooking and heating needs. Providing women and men with access to energy helps them meet their basic nutritional needs; 95 percent of staple foods need to be cooked to be transformed into human energy (DFID 2002). Providing energy also makes access to clean water possible (through pumping or purification). Gender disparities in access to rural energy are significant. Women and girls bear the greatest time and health burdens of providing and using energy in rural areas, spending as much as three hours a day collecting traditional fuels, and 1 million to 2 million of them die prematurely every year from fume inhalation. Men make most of the decisions on the priorities and choice of energy technologies. Because women contribute 70 to 80 percent of the labor for agricultural production and household work, energy equipment that can enhance their productivity would considerably enhance household and community welfare.

A substantive amount of work has been done on gender in energy over the last 20 years, both in academia and among development agencies.[1] However, most of the development assistance with a gender dimension benefited fairly small projects, mostly for improved household fuels production and use, as well as research projects that documented either the issues or the development benefits of including gender in energy projects or programs. In the World Bank the work on gender in energy has been fairly limited and mostly done through the Energy Sector Management Assistance Program, Regional Program for the Traditional Energy Sector, and Asia Alternative Energy Program. Some of the knowledge generated through this work was integrated into the Bank's 1996 Rural Energy Strategy policy paper and into recent projects in Burkina Faso, Lao, Mali, and Senegal.

Energy has been identified as a major input for achieving the MDGs, particularly in rural areas:

- Lighting and clean water (which requires energy) can help reduce maternal mortality.
- Safe water can help reduce the incidence of water-borne diseases and mortality for infants and children under five years old.
- Lighting and power provide higher returns to investments in schools and education (longer use of facilities, higher teacher retention rate, longer study time for children).
- Lighting and power are needed to create businesses and generate income and employment, in particular for women who have less access to labor markets and income-earning opportunities.

This Thematic Note reviews selected issues and does not pretend to be exhaustive. It also offers suggestions for practitioners on how to reflect women's and men's needs and opportunities regularly in the design of energy policies, programs, and projects and on how to monitor results.

KEY GENDER ISSUES

The following discussion looks at the key gender issues to consider in energy projects and programs.

Gender equity and the domestic energy crisis

Although it is a core priority for meeting people's basic needs, *domestic energy* for household needs— such as cooking, heating and cooling, lighting, and food processing— until fairly recently has stayed as invisible in energy sector

policies, programs, and projects as household tasks are to the economy: not counted in GDP, not considered important. For example, in Uganda, although 90 percent of energy consumption is traditional biomass for basic needs and only 1 percent is electricity, 90 percent of investments have gone to the electricity sector and 1 percent for domestic energy, according to 2003 data (Blackden 2007).

Domestic energy tasks in rural areas are disproportionately women's responsibilities, especially when the main sources of energy are collected fuelwood and animal wastes, and where women and girls do most of the cooking. One of the main characteristics of these gender disparities is the time burden on women and girls and, to some extent, young children of both sexes. Another example from Uganda illustrates the problem: there the transport burden of women is four times that of men in time spent, it is five times greater in volume, and a significant share of this burden consists of fuelwood and water. In Nepal women can walk over 20 kilometers on each trip, and the time spent collecting fuelwood is at the expense of income-earning activities or rest. By contrast, when wood sources are significantly closer to homesteads, the time gains and therefore the potential economic improvement to the household and the economy are significant. In Zambia about 600 hours per household could be saved annually if wood sources were within a 30-minute walk from the homesteads. Where modern fuels (kerosene, liquid propane gas) are available and affordable, men's share of time spent on procuring energy on markets increases, as documented in an Integrated Research and Action for Development (IRAD) study (Parikh and Sharma 2006) in Himachal Pradesh, India (table 9.3).

Another major characteristic of gender disparities in domestic energy is the impact on women's and children's health. In Himachal Pradesh 19 percent of the people reported symptoms such as backaches (50 percent), neck aches, headaches, and bruises every week (80 percent). In addition, the unsafe use of traditional biomass fuels causing indoor air pollution is now recognized as a major public health issue. Children under five years of age account for 56 percent of total deaths from indoor air pollution, the main cause being acute lower respiratory infections. The World Health Organization (2002) estimates that 50 percent of the 2.1 million deaths of children under five annually from respiratory infections are attributable to indoor air pollution, lack of adequate heating, and other precarious conditions. Women are also more at risk than men, not just from more acute lower respiratory infection due to smoke inhalation but also from chronic obstructive pulmonary disease, lung cancer, pulmonary tuberculosis, eye damage, and having low-birth-weight babies. Finally, women are more at risk of violence (rape, beating, and injuries), and girls often miss school to assist in wood collection and other food-processing-related chores, at the expense of furthering their education.

Gender-sensitive solutions to the domestic fuel crisis are available, even if they are difficult to implement. They imply a whole range of sociological and behavioral changes, as well as economic and financial incentives to broaden technical options. Solutions range from reforestation with a specific focus on establishing conveniently located fuelwood sources that will reduce the transport burden for women, helping households obtain better stoves and switch to modern fuels, and developing indigenous renewable energy resources for electricity generation:

- Where efficient stoves and fuels other than biomass are available, women save 2 to 3 hours a day, which they can use for alternative productive activities or leisure.[2]
- Where mechanical energy is available to draw water, till, and transport crops, girls' school attendance and performance increase by the equivalent of one or two

Table 9.3 India: Difference in Gender Responsibilities Due to Difference in Need and Uses

	Gender (%)		Age (Average)	
Fuel type	**Men**	**Women**	**Men**	**Women**
Agricultural residue	24.5	75.5	19.0	32.5
Cooking gas (liquid propane)	100.0	0.0	29.0	n.a.
Dung cake	4.0	96.0	57.0	34.0
Kerosene	58.5	41.5	21.5	36.0
Wood	38.0	62.0	53.5	29.0
Others	60.0	40.0	51.5	41.5

Source: Parikh and Sharma 2006.
Note: Young and senior women—biomass; Young men—kerosene and liquid propane gas (LPG).

grades, and when girls are educated, they can enter the job market (UNDP 2001).

- When electric power is available for women to have access to telephones, radio, Internet, and television, they develop businesses, get better prices for their crops, and enjoy a bit of leisure (ESMAP 2003b).
- When women develop commercial energy businesses, regardless of the primary source of energy, the economic value of their labor is recognized, gender relationships change in the community—as seen, for example, in the Char Montaz project in Bangladesh (ESMAP 2004) and the World Bank PROGEDE Project (World Bank 2003)—and women's economic power increases.

The selection of the solutions, therefore, requires the equitable participation of women and men in decision making, as discussed in the following section.

Gender equity in decision making

Given their traditional household responsibilities, rural women are the main decision makers regarding fuelwood collection: when, where, and with which group of women to do it. Rural women also manage biomass use and adjust to growing biomass fuel shortages by changing food-processing techniques, cooking fewer meals, and changing the types of food eaten, where possible.[3] By contrast, rural women traditionally tend to have limited decision-making power about household purchases of energy commodities (candles, batteries), including priorities in energy expenditures and investments, and choice of technologies. When it comes to community decisions, men for the most part attend community-level meetings at which community investments are discussed and decided, and they rarely report to women on those decisions (Agarwal 2001). At the national level few women are among the energy policy makers, either in relevant ministries or in parliaments. However, because rural women are the main suppliers and consumers of energy, associating women with energy would benefit individual households, whole communities, and whole countries. Educating women about energy options and technologies can increase women's abilities to contribute to energy solutions. Table 9.4 lists the areas and range of issues in which the participation of women, not only men, in decision making is essential.

Empirical research shows that households' transition to modern fuels changes when women's and men's labor is valued as a function of income opportunities from the time saved through using modern fuels, including when wood becomes a commodity rather than being collected.[4] Consequently the integration of gender into the decision-making process toward the transition to safer and more efficient fuels for cooking, lighting, and power could be accelerated if both women and men participated in income-generating activities. This, in turn, would mean introducing energy solutions that free women's labor for higher income-earning opportunities and providing women with opportunities to be more effective energy suppliers, regardless of the fuel source: improved wood or charcoal production, liquid propane gas or kerosene marketing, and any other energy supply enterprise.

Gender equity in accessing rural energy assets and services

Traditional energy assets include woodlots or community forestry as well as collection rights over animal waste. Modern energy assets range from individual household energy systems—solar home systems, biogas systems, on-farm windmills, dual-purpose diesel engines (for irrigation during the day and electricity generation at night)—to community systems, such as microhydro or diesel plants and community wind farms. Individual households and communities rarely have access to grid electricity generation assets, but communities or farmers' associations can be the owners of electricity distribution assets (for example, rural electricity cooperatives in Bangladesh, the Dominican Republic, and the Philippines).

Access to energy assets tends to be gender biased to women's detriment because of traditional land rights, the greater participation of men in community infrastructure decisions, and women's greater difficulty in accessing credit to acquire assets or services for lack of collateral. The frequent argument that women are reluctant to change does not hold. For example, the study done in Himachal Pradesh (Parikh and Sharma 2006), documented that 71 percent of women there were willing to pay to install a window to improve ventilation and reduce indoor air pollution, and 82 percent were willing to use clean fuel (table 9.5). Informing women about energy solutions and encouraging them to organize to develop their own energy assets is one well-tested way to correct the gender disparities in access to energy assets and services. An example of this is found in a photovoltaic pump project in Brazil, where the system reduces women's drudgery and contributes to increased economic activity, better health, and improved living conditions (Branco 1997).

Table 9.4 Energy Issues Demanding Gender-Balanced Participation

Energy choice	Issues	Gender perspective
Woodlots	Plantation, location, and choice of trees for their calorific value; conditions of utilization; whether to continue fuelwood collection from natural forest or wasteland or establish a plantation.	Proximity of woodlots saves family labor, mostly women's and girls', reduces risks of harassment, diminishes transport burden; selection of trees with higher calorific value reduces volume to be transported.
Fuel switching	Whether to move from wood to more costly but higher calorific value, fuels such as kerosene and liquid propane gas (LPG; when available) for cooking; limited LPG-distribution networks, high cost of first canister; women's time collecting, transporting, and preparing fuelwood and other biomass fuels is not given any economic or financial value; when the price of modern cooking fuels increases, the poor revert to traditional fuels or women cook and eat less.	Redistribution of time allocated to fuel procurement between men and women; time saved by women can be reallocated to other activities (leisure, learning, child care, productive activities); higher calorific value of modern fuels saves women's household expenditures.
Cooking fuels versus electricity	Whether to invest in cleaner and more efficient cooking fuels versus electricity	Women, girls, and small children are the main beneficiaries of cleaner and more efficient fuels in terms of time saved, reduced health risks.
Cooking and other household appliances	Improved stoves needed for more efficient use of biomass and to reduce health risks; radio and television provide information and leisure	Health gains from improved stoves may provide higher benefits to the family than investing in a radio or a television, although women and girls will initially benefit more than men.
Use of household energy	When and for what to use power and lighting.	Women will optimize the use of power and electricity to household chores, children's studying time, and nighttime productive uses before using leisure-oriented appliances. Men tend to be more sensitive to the latter use.
Individual household versus community energy services	Investing in energy to serve community facilities rather than individual households	Women tend to give higher priority than men to investing in energy to serve a community clinic, school, or a center for productive services where they can work outside the homestead (food grinding, productive activities, telecenters).
Off-grid versus grid extension	Off-grid electricity solutions may be provided faster than grid-extension when infrastructure is limited	Women are inclined to see the immediate benefits of off-grid solutions rather than waiting indefinitely for the grid.
Institutional arrangement for energy service provision	Privately owned versus cooperative or community-owned energy enterprises	Women more easily see the opportunity from cooperative or community ownership for personal empowerment as well as meeting the needs of the whole community.
Technical options	Limited number of women managers, engineers, and technicians in energy enterprises	Women managers, engineers, and technicians tend to be more sensitive to designing technical options that meet women's constraints (location of the Solar Home Systems, electrical boxes, weight of improved stoves, and others).
Policy making and choices	Targeting of subsidies, determination of priorities for investing in energy infrastructure and services, tailoring of programs to meet women's as well as men's needs	At the national level, women decision makers will weigh the pros and cons of targeting subsidies for cooking fuels, which benefit women more directly versus for electricity connections, and will give stronger consideration to domestic and productive use of energy issues.

Source: Author.

Table 9.5 India: Women Willing to Use Clean Fuels in Shimla, Himachal Pradesh

Yes (82.5%)		No (17.5%)	
Reason	**Response (%)**	**Reason**	**Response (%)**
Easy accessibility	7.0	The place is too far away	5.0
Convenient (to turn on/off)	18.0	Supply is inadequate	7.5
Cleaner household	36.0	We forgo our share of rations	12.5
Time saving	39.0	We do not need it	26.0
		It is expensive	49.0
Total	100.0	Total	100.0

Source: Parikh and Sharma 2006.

Gender equity in accessing rural energy business opportunities

The supply of rural energy services can be a significant business in rural areas, creating income and employment. The participation of women and men in various energy supply businesses tends to be technology driven, with a higher participation of men in such activities as electricity generation based on diesel, microhydro, modern biogas, and solar power, whereas women's businesses are based on traditional biomass (charcoal and dung cakes). Providing women with opportunities to create modern energy businesses is therefore important to correct disparities, and successful examples are now emerging from many countries (box 9.5).

Improved availability of energy services provides opportunities for creating new businesses. In the Philippines and Vietnam, households with electricity have two or more times as many businesses as households without electricity (fig. 9.2). Studies also document that rural women even more than rural men become entrepreneurs as soon as lighting and power becomes available, starting home-based or community-center-based businesses. In the Philippines the majority of home-based microbusinesses have been started by women (ESMAP 2002). In addition, lessons from experience highlight that rural energy programs need to include a "productive uses" component to couple the development of the energy services with the development of income-earning opportunities that can generate enough income and thus revenues to pay for the service. In Bolivia the rural electrification program also includes a rural ICT and business development program, including microcredit for the development of new businesses. It is critical, therefore, to ensure that both women and men participate in such income-generating programs. For women, such programs enable progress toward meeting a major set of their strategic economic and welfare needs.

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

The bias of rural energy programs toward rural electrification, noted earlier in the discussion of issues in this Module, causes women's energy needs and solutions to be neglected. Correcting for this bias requires a shift from the supply-driven approach that has dominated numerous rural energy development programs to a demand-oriented approach. Some suggestions for addressing these problems and others related to gender in energy follow.

Undertake gender audits. The gender audit is a tool developed by ENERGIA.[5] Gender audits look at energy policies, government practices, and institutions. They identify gaps in energy and gender approaches and formulate recommendations to fill the gaps. Many governments—for example, in Cambodia and Uganda—have now elected to have gender focal points in all the technical ministries to work closely with the ministry of gender and social affairs. Practical suggestions to ensure gender-equitable rural energy policies include the following:

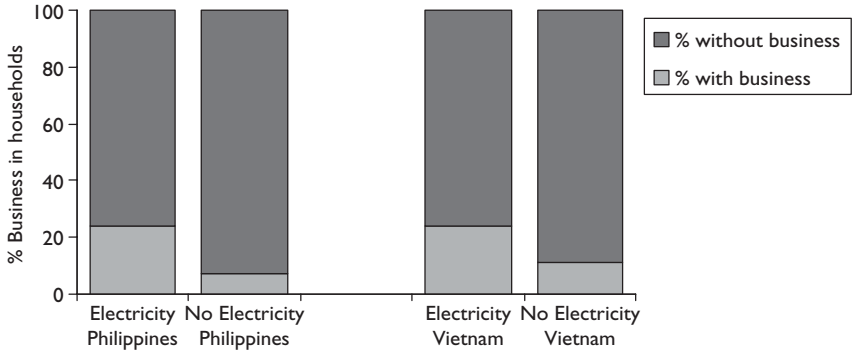
- Ensure the participation of women's groups in policy formulation.
- Systematically question the impact of rural energy policy interventions not only on women's and men's time and work profiles but also on the control over the resources and on their social and economic empowerment.
- Collect and use sex-disaggregated data to monitor progress. For example, monitoring the results of a policy intended to expand access to off-grid electricity services might reveal that women's uptake is less than men's because they lack access to credit and collateral such as land titles. Pricing and financing mechanisms should be analyzed for differential impacts on women and men.

Box 9.5 Bangladesh: Poor Women Bring Light and Power to the Community of Char Montaz

When the project started in 1998 with ESMAP financing, Char Montaz, a small remote island in the Gulf of Bengal, had only one electrical minigrid serving a few shops on the marketplace. Ten years later, an increasing number of households have solar home systems, and the marketplace is well lit and includes many new power-based activities. A group of 35 poor women, most of whom only have three to five years of primary education, are behind this breakthrough in bringing modern energy services to the island. They were provided with training to organize as a cooperative microenterprise, to assemble DC lamps, compact fluorescent lamps (CFLs), and LED lamps, controllers for solar home systems, and phone chargers, and to run a diesel-based minigrid and other services, such as a battery-recharging station. This women-owned enterprise, now selling mostly solar home systems in Char Montaz and other islands and communities of southern Bangladesh, has been the major vehicle for bringing power and light to these remote communities. Today, however, they mostly employ men in the solar home business, while women are using the available light and power for other types of home-based businesses and shops.

Source: Lallement 2008.

Figure 9.2 Rural Philippines and Vietnam: Households with Business Income



Source: ESMAP 2002.

Provide gender-awareness and sensitivity training for policy makers and program and project designers, including those in financing agencies, such as the World Bank. Gender sensitivity in national rural energy policies is most likely to be advanced in cases where government policies related to gender equity are already in place.

Adopt a demand-oriented approach. The demand-oriented approach starts with the assumption that understanding gender and poverty issues is an important part of the development and implementation of rural energy projects and will eventually impact the viability and effectiveness of the projects. The needs assessment provides information to project designers, households, and communities to make informed decisions on the choice of rural energy technologies and services, institutional arrangements, and financing mechanisms that will best respond to the needs of all the members of the community. The needs assessment provides the foundations for longer-term programs.

Integrate gender monitoring and evaluation into the full project cycle. Implementation of rural energy programs is usually done in a series of projects that span four distinct phases: preparation, design, implementation, and postproject impact assessments (Dayal 2007). Mirroring the recommendation to inform the gender dimension and impact of rural energy policies, a need is present to integrate monitoring and evaluation parameters for projects at the preparation stage, so that the input of the potential beneficiaries and participants helps shape the design of the project.

Use gender-assessment tools. Numerous tools have been designed over time to conduct gender assessments,[6] but two

distinct tools are recommended here: participatory assessments and socioeconomic impact surveys (ESMAP 2003a). The types of activities in *participatory assessments* include community mapping, stakeholder meetings, focus group discussions, and other participatory techniques. *Socioeconomic surveys* provide baseline data for the people living in the project area, and when conducted at periodic intervals, they allow the tracking of progress and the long-term impact of rural energy projects. The surveys involve collecting quantitative data through questionnaires (box 9.6), random samples of populations, and formal interviews. Participatory assessments are more focused on local conditions, whereas surveys have the merits of generating information that can be generalized to a broader population. A good example of a project where these tools have been used is the Lao PDR Rural Electrification Project financed by the World Bank (World Bank 2007).

Box 9.6 Topics for Survey Questionnaires

- Socioeconomic profile of actual and potential beneficiaries and customers
- Fuel and energy use before improved electricity services, including energy from all sources, such as candles, biomass, batteries, electric grid, and diesel generator sets
- Monthly expenditures on fuels and energy, by source
- Potential and actual willingness to pay for energy services, by application
- Energy use as it relates to substitutes for improved electricity services (kerosene, candles, and others)
- Energy use as it relates to substitutes for improved cooking/heating/cooling services (biomass, kerosene, paraffin, and ice)
- Reasons for not connecting to the grid or purchasing improved energy services
- Barriers to the adoption of improved electricity or other technologies and services
- Incentives to overcome barriers to adoption of improved electricity or other technologies and services
- Appliances in households and small businesses, including those with and without electricity
- Time use (men and women) as it relates to existing energy use and appliances.

Source: ESMAP 2003a.

THEMATIC NOTE 3

Information and Communication Technologies

In an increasingly globalized and networked world, rural women and men should have access to a range of information to enable them to make informed choices concerning their livelihoods, management of resources, community health, and development, and to understand and influence the policy decisions that impact them. The role of ICTs in enabling women and men to access and compile this kind of information cannot be overestimated. Despite much support for the diffusion of ICTs in rural areas, gender disparity in access to ICT services continues, much to women's detriment. A widespread assumption that rural women have no real use for or interest in ICTs persists. Examples from around the world prove otherwise.

ICTs are commonly referred to as comprising the converging modern-day technologies of phone, wireless, and Internet. ICTs in a rural context, however, must also include traditional technologies, such as radio, satellite radio, and television. Over time, we can expect these distinctions to blur as the technologies converge further. The three defining characteristics of modern ICTs are their *convergence,* their *speed,* and, increasingly, their comparatively *low operating costs.* These characteristics offer a broad range of possibilities for information collection, manipulation, transfer and transmission, storage, and presentation, which can be effectively applied in rural contexts. As technologies and software applications improve and their diffusion spreads, ICTs offer rural populations new ways of networking and communicating. ICTs complement other forms of communication that are indispensable to improving rural livelihoods (box 9.7).

At the time of writing, the technology of choice in terms of bridging the information gap between rich and poor is the *cellular telephone* and not the personal computer: "emerging markets will be wireless-centric, not PC-centric."[1] Mobile telephone subscriptions will continue to increase at a very dramatic pace, rising from an estimated 15 million in 2004 to 191.8 million by 2014—raising the penetration level from

Box 9.7 Communication for Development

Communication for Development is based on the premise that successful rural development calls for the conscious and active participation of the intended beneficiaries at every stage of the development process. Rural development cannot take place without changes in attitudes and behavior among the people concerned. Communication for Development is defined as the planned and systematic use of communication, through interpersonal channels, ICTs, audiovisuals, and mass media in an effort to accomplish the following:

- Collect and exchange information among all those concerned in planning a development initiative with the aim of reaching a consensus on the development problems being faced and the options for their solution.
- Mobilize people for development action and assist in solving problems and misunderstandings that may arise during plan implementation.
- Enhance the pedagogical and communication skills of development agents (at all levels) so that they may have a more effective dialogue with their audience.
- Apply communication technology to training and extension programs, particularly at the grassroots level, to improve their quality and impact.

Source: FAO and GTZ 2006: 3–7.

2.2 percent to 19.4 percent in all least developed countries.[2] Wireless phones allow farmers to check prices in different markets before selling their produce, they make it easier for people to find work, they can be shared by a village, they pose fewer problems for the illiterate, and the content is in the local dialect and instantly shared.

One limitation to ICT access is its dependence on a dependable source of energy. Radios may run on batteries, but cell phones and computers are ultimately dependent on a supply of electricity. In other words, the physical access to ICTs in rural areas (including community connectivity points such as telecenters or Internet cafés) is reliant on a dependable energy infrastructure.[3]

At the core of ICTs is the range of interactive communication tools that have the potential to support *participatory mechanisms,* enabling those with access *direct* engagement around the decisions that affect them. The connectivity factor, whether phone-to-phone or computer-to-computer, changes the mode and immediacy of communications and, in the process, fosters different organizational relationships between different stakeholders. The continuing momentum in the development of mobile connectivity has important implications for men and women in terms of their own mobility, security, privacy, and the time it takes to access information.

WHY GENDER PERSPECTIVES MATTER IN IMPROVING ICT POLICIES AND PROJECTS

Gender perspective is critical in ICT for three main reasons:

- Rural women face significant disadvantages in information, communication, transactions, access to services, access to skills and education, access to earning and employment opportunities, and "voice."
- ICTs (the full range, including everything from radio to mobile phones) can be highly effective tools in addressing these disadvantages.
- However, for ICT interventions to be effective (and, indeed, to avoid making women's disadvantages worse), they must be designed and implemented in a gender-sensitive way from the start.

Although gender-differentiated data are difficult to find, reports indicate gender differences—in particular that women's rates of Internet access and use do not automatically rise with national rates of Internet penetration (Hafkin 2007). An awareness of gender differences between men's and women's socioeconomic contexts is important in determining how to deliver ICT programs that meet these differentiated needs. Broadly speaking, these gender differences in a rural context include the facets listed in table 9.6.

The Warana Wired Village Project in India serves to illustrate the unintended implications of *not* including women. Warana lies in the sugarcane belt of the most prosperous regions in Maharashtra. Kiosks were set up in 70 villages and equipped with a computer and printer, which were networked to the Central Administration Building via wireless telephony. Looking back, project staff pinpointed weaknesses of the project, many of which were attributed to the omission of women as beneficiaries. Warana neither assessed the information needs of the community nor promoted local ownership and participation. Because Warana did not attend to women and poor people's ICT access, these groups were marginalized. Women were not encouraged to become information kiosk operators, and the resulting increase in men's digital literacy exacerbated the men-women digital divide. The poorest, landless laborers and tribal groups did not use the kiosks, even though these groups would benefit the most from the available information about employment and educational opportunities.[4]

There are a number of sociocultural factors common to women's access to and use of ICTs in rural areas worldwide:

- Cultural attitudes discriminate against women's access to technology and technology education: what would a woman farmer want with a computer?
- Compared to men, rural women are less likely to own communication assets, such as a radio or cell phone.
- Rural women are less likely to allocate their income to use in public communications facilities, except when they need to communicate with family or to arrange for income transfers.
- Rural women are often reluctant to visit "cyber cafés" or public Internet centers, which are often owned by men and visited by men. The café culture often excludes girls and women from frequenting them.
- Rural women's multiple roles and heavy domestic responsibilities limit the time they can allocate to learning and using ICTs, until and unless they realize the potential information benefits (and time-saving elements) of using these technologies.

Unless gender considerations are incorporated into employment policies, ICT diffusion strategies, or national policies, strategies may inadvertently result in negative consequences that compound gender and income disparities. Many developing countries are turning to the ICT sector as a new means of attracting foreign direct investment,

Table 9.6 Major Factors Regarding Gender Differences in Rural Populations

Gender differences	Major factors
Higher information paucity for and among women compared to men	Rural women face narrow choices of information and low perceptions of the value of indigenous knowledge. The negative effects of this poverty of information in terms of health, agriculture and livestock farming systems, harvesting and marketing, and environmental resource management put the typical rural woman at a distinct disadvantage.
Women's relative lower access to and control over resources	Lack of access to and control over land, water, and energy resources is a key factor of economic poverty, social exclusion, political subordination, and cultural marginalization. Relative to men, women are more likely to suffer the consequence of systemic loss of control over resources, and this also applies to their control over ICT assets.
Imbalances in education and training between men and women	Rural girls and women face a challenging set of circumstances in which the school system and the social structure reinforce each other and work against women's equal access to training, from primary education to higher qualifications to lifelong learning.
Lack of balance in representation of women's and men's needs and interests	Whether through intermediary agencies, local government bodies, farmers, associations, microcredit institutions, or capacity-building organizations, rural women lack a voice in determining or negotiating their strategic needs, and again, compared to men, are more likely to be left behind in articulating their specific interests. Communication media also play a dual role in reinforcing and challenging gender stereotypes.
Different gender roles in food production	In many regions of the world, women play a vital, if underrecognized and unsupported, role in food production. They have less access to extension training, affordable credit, and loans than do men. This works against their access to ICTs as well. By implication, women have less opportunity to articulate, negotiate, or act upon their concerns in the food production sector at the policy level. At the same time, research indicates that women make up to 65 percent of day-to-day on-farm decisions and 80 percent of marketing decisions.
Women's greater dependence on environmental income	Rural women derive a significant portion of their total income from ecosystem goods and services (forests, grasslands, lakes, and marine waters provide resources, such as building materials, fuel, fish, medicinal plants) and from small-scale agriculture. Because of this dependence on environmental income, the poor are especially vulnerable to ecosystem degradation and to physical disasters brought on by climate change, such as increased hurricanes, droughts, erosion, and flooding.

Source: Author.

primarily in data entry and call center facilities. These facilities, however, are currently located in a handful of countries: China, India, Ireland, Israel, Mexico, and the Philippines. The projected development of this aspect of labor-intensive, low-skilled ICT work seems to be no different from the route followed by the long-established garment and electronics industries: poor wages, poor work conditions, the absence of workers' representation, little to no skill or technology transfer, absence of career growth, and feminization of the low-end, low-paying jobs. Some e-commerce–based initiatives in which women are producing crafts or handmade products to market online do not in fact provide women with direct control over ICTs. They are quite far removed from the decisions and the applications around ICTs. In contrast, initiatives exist in which ICTs are integrated comprehensively throughout an existing institution, such as in Self-Employed Women´s Associations, in which women learn to apply different kinds of ICTs to a wide range of activities.

ICTS RELEVANT TO RURAL WOMEN

ICTs have an increasingly important role in the *delivery of services and infrastructure* to women in rural areas. In many countries ICTs are an integral part, if not *the* underlying platform, in the delivery of municipal services. This includes software applications in the budgeting and forecasting, monitoring, and planning, and increasingly the delivery of a wide array of critical services in rural areas. ICT software can be applied to monitor systemic infrastructural issues, such as water and sanitation services, energy, and transport.

A growing aspect of ICTs is their potential to provide a *secure and mobile platform for commercial engagement and financial transactions,* with its related income, credit, and savings implications. ICTs can supplement or support financial services through applications that extend and manage credit support to women-run rural enterprises. Migrant and other income remittances that many rural families depend upon are also facilitated through SMS (short message system) or e-mails to request money from relatives or to receive notice of a transfer waiting for pickup at the local post office outlet. Debit or stored-value "smart" cards are other technologies that facilitate remittances. The all-women Dhoblai Milk Cooperative Society of Naila village in Rajasthan, India, has pioneered a business accounting and payment system, using smart cards for its members. The system helps maintain accurate milk supply records as well as secure payment transactions. SMART money in the Philippines allows remittance senders in 17 countries to transfer money electronically to their subscribers' home accounts and smart cards (see Module 3).

Rural women often supplement their income from agricultural activities through engaging in a wide range of other activities. ICTs and the digitization of information enable businesses and companies to locate and manage production away from the main site (for example, Bangladeshi village girls sewing shoes for a local shoe-exporting company). This has implications both for the individual employment of women and for the growth of clusters of small enterprises and their ICT investments. ICTs offer women the possibilities of both flexible locations and flexible hours through telecommuting or self-employment. Conversely, women's "flexibility" may also result in casual, part-time, piece-rate, and seasonal employment.

GOOD PRACTICES AND LESSONS LEARNED

Innovative Activity Profile 2 describes the gender approach of Community e-Centers established in Malaysia. Other examples from the African Great Lakes Region, Armenia, Brazil, Fiji, India, Nepal, Somalia, Sri Lanka, Uganda, and Uruguay are presented below.

Addressing rural women's illiteracy issues

Radio and mobile telephony can jump-start women's access to information without literacy. Simple and effective applications have been developed and applied in the field to enable illiterate users to access information critical to their socioeconomic welfare. *Macallinka Raddiyaha* (the Radio Teacher) in Somalia was launched in 2002 by the Africa Educational Trust with the BBC World Service Trust.[5] This education project teaches rural Somali women and men to read and write through radio programming and training. The program includes three teaching elements: a half-hour weekly radio program broadcast by the BBC World Service, print materials, and face-to-face teaching. The radio programs use materials almost entirely from Somalia that look at human rights issues, ways of sustaining the environment, and strategies people can use to be healthy. Literacy teaching is based on key words that emerge from the radio programs. The radio programs are heard all over Somalia and in neighboring countries, including Djibouti, Ethiopia, Kenya, and Yemen. In this instance, ICTs supplement and enhance more traditional learning methods.[6]

In Bolivia, AGRECOL initiated a documentation methodology project to help farmers share local knowledge and develop local capabilities through multimedia presentations.[7] Earlier methods of information exchange were costly, and minimal sharing of information took place between those people who did and did not attend. Moreover, few women could leave their houses to participate, thus confining the benefits of information exchange to men farmers. Recognizing these limitations and the interest of farmers to record the farmer visits (some farmers would bring tape recorders or cameras to the exchanges), AGRECOL made ICTs available to the rural farmers. Now the Quechua-speaking farmers use digital cameras, laptop computers, and multimedia projectors to record and share their local knowledge, particularly about organic agriculture and resource management. The local facilitators and farmers are the ones who choose a topic, solicit experiences, develop a storyline and script, select appropriate technologies, carry out the documentation, edit material, create a presentation, screen the presentation with the community, and revise the product until it is an accurate portrayal. Local appropriation of ICTs is evident in the ways in which local groups have broadened the scope of their presentations. Women have benefited from the documentation process through increased access to information, which improves planning for farming and natural resource management, which in turn can increase crop yields and income.

Certain features of the project are indicative of the First Mile Principles outlined at the end of this Thematic Note. The selected ICTs emphasize oral and visual communication, which not only is in keeping with local culture but also strengthens the processes of local knowledge that can disappear through migration and the undervaluing of local culture. The documentation process can be used to build relationships

with local authorities and other development organizations, thereby improving the collective capacity of the community. The presentations have created new learning opportunities for rural households, and women farmers who had been excluded can now be reached effectively (Piepenstock, Arratia, and Aguilar 2006).

Developing content relevant to rural women

The Kubere Centre in Uganda aims at improving access to information for rural women on the basis of the outcomes of information needs assessments. Women indicated that their main interest was in farming techniques, market prices for farmer produce, and health and education issues. The information center has newspapers and magazines and distributes leaflets and brochures on a variety of topics, many of which are agriculture and health related. It has Internet connectivity and makes use of World Satellite Radio as a source of external information. A reporter seeks out rural communities and collects local information, which is repackaged to suit the needs and capacities of the recipients. This results in folders and leaflets and in special radio programs, produced by women for women, which are then broadcast on community radio. Women in rural communities have established listener groups and will gather to listen to the radio. Each of these groups has a mobile phone through which they receive information on market prices and with which they can phone into radio shows during question-and-answer sessions. The women were very enthusiastic about both the radio and the mobile phone because the devices were easy to use, created a sense of community, and did not require them to travel or to acquire complex technical skills.

Enabling women to access resources more effectively

ICTs are becoming an integral platform for the delivery of critical services to the poor. As government social and education services such as land ownership databases, registration for health support, and information on legal rights are diffused, women are better able to tap into these information channels for their economic and strategic needs. The Well Women Media Project in the Horn of Africa and African Great Lakes Region was launched by Health Unlimited,[8] a United Kingdom–based NGO that supports communities affected by war or conflict to achieve better health and well-being. The Well Women Media Project works with local audiences in Rwanda and Somalia to develop interactive radio and television programs that promote "positive" attitudes toward women's reproductive and sexual health. Programs include soap operas and phone-in shows dealing with issues such as HIV and AIDS, domestic violence, genital mutilation of women, and birth spacing.

Addressing imbalances in education and training

Women's digital literacy can be supported through a range of ICTs, which are an important interactive tool of education. Good examples can be identified of applied forms of formal and informal peer learning. Planners can introduce women to the concept of lifelong learning and provide them with the tools to create their own teaching materials for other women. Distance education through ICTs also presents an important opportunity for the otherwise isolated or time-constrained woman.

Many rural dwellers in developing countries do not perceive domestic violence and the lack of access to education, information, and social services as violations of basic human rights. To redress such injustices, the Digital Broadcast Initiative provided access to locally produced, high-quality information on topics that assist communities in advancing their social and economic development efforts. From 2001 to 2006 the initiative distributed vital information, education, and leadership training to remote rural communities through satellite and AM/FM radio. The project was piloted in Nepal and was later implemented in Afghanistan, Cambodia, India, the Lao People's Democratic Republic, and Tajikistan. Tackling issues such as agriculture, HIV and AIDS prevention, women's empowerment, law and justice, and landmine awareness, programming was distributed through a combination of satellite and FM/AM radio and multimedia and solar technologies selected to meet local needs and infrastructure. Because many remote listening communities lack sufficient energy resources, Equal Access distributed car batteries and solar panels to fuel satellite receivers. In Nepal a rural women's listening group spearheaded a program against the social ills of drinking alcohol and gambling. Following a program on safe migration, a young Cambodian woman decided against migration after following the program's advice on checking the specifics of her potential job, fearing she would be trafficked into the sex trade.[9]

The e-Lanka Development Project in Sri Lanka uses e-government applications in education services that are tailored to promote women's skills training.[10] Telecenters are set up around the country to provide access to ICT services, including Internet, e-mail, and computer classes for

poor rural communities that would not otherwise have access. The centers are run by rural businesswomen and men (women form the majority of owner-operators). A voucher scheme initially grants women and rural youth free access to rural telecenters. This is phased out once they understand the potential uses of ICT and the value of the facilities and services; then they pay a few cents per hour to make the centers financially sustainable. The World Bank currently lends an estimated $1 billion per year to various e-government projects. Services such as online access to land, voter registration, and license applications can benefit women and youth, especially when such services would otherwise be available only in the capital.

Representing rural women's needs and interests

As women use ICTs (including radio and video) for communications and information purposes, they are able to relay direct messages to policy makers and initiate change in their interests. The Rural Outreach Programme in Uganda uses a variety of information and communication strategies and tools to raise women's awareness about their rights. Women journalists visit 10 rural districts four times a year to conduct participatory workshops on issues ranging from reproductive rights to constitutional rights to political and economic rights. Issues raised are often adapted into plays that are staged within the communities and tickets are sold. Between visits, communities organize into radio listening clubs to discuss programs developed for rural populations. During field visits that last four or five days, women journalists record participants' experiences, which are aired on Radio Uganda or published in local newspapers.

In 1994 the Dimitra Project was launched by the European Commission as a unique tool for women and their organizations to make their voices heard at the national and international levels. The Dimitra network acts as a two-way communication channel by bringing information from the grassroots level up to decision makers and vice versa. Dimitra's main goal is to empower rural women and to improve their living conditions and status by highlighting the extent and value of their contributions to food security and sustainable development. The network operates on three basic principles: (1) working closely with its 10 local partners in Africa and the Near East to highlight local knowledge, (2) encouraging the active commitment of civil society organizations, and (3) networking to promote and support the exchange of good practices, ideas, and experiences using traditional and new communication technologies and tools and local languages. The information collection and dissemination capacities of the partners are developed through linkages with rural community radio stations and the development of local content by the rural women themselves. Various technologies support the Dimitra network. The FAO-Dimitra Web site contains an online database in English and French with information on over 1,420 organizations, 3,000 projects, and almost 1,000 publications. In addition, Dimitra has provided information at all levels using different media (television and radio broadcasts, films, press articles, demonstrations, newsletters, databases, and CD-ROMs).[11]

Fiji's Foundation for Rural Integrated Enterprises N Development (FRIEND) is recognized for its creative and effective efforts to alleviate poverty by creating opportunities for communities using existing skills and resources in a meaningful manner that benefit rural women. FRIEND uses a variety of ICTs: the organization's Web site and newsletter advertise their projects, initiatives, and products; e-mails are one of the primary means of communicating and exchanging information; mobile phones are used to reach rural areas; a partnership with *Femlink* facilitates the broadcasting of community initiatives on radio programs; and some of the projects have been televised. FRIEND has three programs—income generation, savings program, and governance—that are targeted in rural contexts. Almost three-quarters of the participants in the income generation and savings programs are women. Women are encouraged to use their traditional skills and locally available resources, and so a clear message is given that local (indigenous) knowledge and those who use it are valuable. FRIEND addresses gender and rural-urban disparities in unequal access to education and training by offering diverse trainings to participants *and* their families. Training courses range from leadership, production, and packaging regulations to business planning, budgeting, marketing, and savings options. FRIEND is committed to ensuring that rural women and men articulate their own ideas for economic empowerment and to following up with the necessary support to make the ideas a reality. In doing so, FRIEND is challenging the lack of representation of rural women.[12]

Supporting women as food producers and natural resource managers

The AGRECOL Andes Foundation in Brazil uses participatory learning settings to teach the processes of recording and cataloguing sustainable agricultural practices using ICTs. Local facilitators are trained to use a combination of digital camera and computer presentation software to produce

animated presentations. As a result, farmers are articulating their local knowledge and contributing to the construction of new knowledge. For instance, a group of women working with medicinal plants and a group of beekeepers generated new group knowledge out of their individual experiences. The beekeeping group went on to use ICTs to generate materials for project management, fundraising, and marketing. In other words, communities will find new applications of ICTs for their own benefit (as opposed to ICTs creating communities for ICT benefits) (Burch 2007: 40–41).

The Network of Groups of Rural Women of Uruguay coordinates women's groups from rural areas in south and central Uruguay. In 1991 rural women began organizing into self-help groups, and by 1994 the network was formalized. The network has five goals: (1) minimize gender e-exclusion, which is particularly prevalent in rural communities; (2) develop access to information for activities in rural areas; (3) facilitate access of rural people to the work market in equal conditions to the people with formal education on ICTs; (4) disseminate ICT training to rural communities so they can develop social and productive activities; and (5) develop a knowledge base about on-demand ICT training for rural women. Member groups have various areas of focus—some are business oriented, focusing on their canning, cheese-making, apiculture, or woodworking activities, whereas others concentrate on improving community life in health and education. For one of its projects the network has collaborated with the "Women for Democracy, Equity and Citizenship" and the Universitario Autonomo del Sur. The strategic partnership is aimed at strengthening linkages among universities, research centers, gender organizations, and women's organizations to develop networking and e-learning strategies for women's digital literacy. The project also aims to increase the visibility of rural women's contributions to society. Updates of this and other gender issues and news are featured on one of the country's popular Web sites, Montevideo.com.[13]

Raising awareness and boosting livelihoods for rural women

International institutions such as the Food and Agriculture Organization (FAO) have developed content, participatory training methodologies, and partnerships that use rural radio to raise awareness about issues critical to rural development. The FAO's rural radio program focuses on establishing community radio stations owned and managed by the community, connecting these stations to the Internet, and training broadcasters to carry out participatory content development. In addition to providing resources, the rural radio Web site supports an online community of radio practitioners around the world. A dedicated portal also provides specialized content, including a warning service on food security from Simbani Africa and a news service that focuses on human rights and democracy, gender and development, environment, HIV and AIDS, and food security.[14]

The Network and Capacity Building for Rural Women in Armenia project's aims were to improve the livelihoods and status of rural women and to support gender equality in the local community through teaching them ICT and its use, to contribute to the establishment of a women's club that would promote information exchange among rural women and disseminate up-to-date information, and to strengthen existing ties among various agencies and rural women through improving women's access to ICTs. The project design reflects the First Mile Principles (outlined in the following section of this Thematic Note), in particular through its solicitation of local women's problems and needs. Not only has the initiative improved the lives of the women participants, but it has also brought innovations and valuable skills to the villages. However, its exclusive focus on women may alienate men and further increase women's burden to support household and community life. Rural men also need the skills and knowledge to enter the information age and to work alongside women to fight against discrimination, social injustice, and gender inequality.[15]

More than 15,000 rural artisans from the desert districts of North Gujarat, India, have joined the SEWA Trade Facilitation Centre (STFC; www.sewa.org) in hopes of overcoming their poverty through enhanced trade. STFC is a unique grassroots commercial enterprise that connects rural craftswomen in the informal sector to computer operators, who sell their textile and handicraft products online. STFC shareholders gain socioeconomic security and full employment through the efficient integration of the design, production, and marketing of their products and services in mainstream national and international markets. Previously women's craft activity was done on a project basis with limited market access. Building producer-buyer relationships was difficult because different stages of production, such as designing, cutting, stitching, and finishing, were outsourced to many women. As a result of scattered production, rejection rates frequently rose above 25 percent. After STFC worked to coordinate the supply chain and standardize production, rejection rates decreased to 11 percent, and the length of the production cycle dropped from six months to two and a half months.

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

ICTs can reinforce gender differentials or help overcome them. Enabling marginalized groups to appropriate ICTs is as much about overcoming the "information divide" as it is about pushing forward the processes of social inclusion. In other words, *closing the information and communications divide is one aspect to closing the economic and social divide between men and women.*

There are good reasons for optimism about the development of ICTs and the benefits that may accrue to women, and especially to poor women. This optimism, however, is conditional on countries' and regions' ability to support effective, proactive, and deliberate policies that push for the social inclusion of women in all spheres of economic and social activity and decision making. In the absence of deliberate policies, the diffusion and use of ICTs and their intended benefits can actually exacerbate existing income and economic divides, with the poorer sections of the population being further marginalized, exploited, and impoverished as a result. ICT programs and policies must be developed to increase poor people's access to information, to enhance the transfer of these technologies to resource-poor areas so that people can learn how to use these tools, and to improve the quality and delivery of education and other public services.

The following First Mile Principles are five key recommendations for practitioners put forward by the Intermediate Technology Development Group in its report "Connecting the First Mile: A Framework for Best Practice in ICT Projects for Knowledge Sharing in Development" (Talyarkhan 2004):

Assess ICT capacity needs among men, women, and different social groups, and build this into project planning, budget allocation, and capacity building toward ICT. Be cognizant, in any aspect of capacity building, training, or outreach to rural women, that there may be a role for ICTs. Incorporate a range of interactive audiovisual and digital tools to enable men and women to gravitate toward different tools for different purposes. In Uganda village women were given a simple microphone and tape recorder to share their stories about the abuses they faced during the long civil war during Idi Amin's regime. Personal stories from the war were being heard and shared for the first time as a result, with significant outcomes for both individuals and the broader community alike.

Poor women and men are most effectively reached not as individuals but as distinct gender groups, and this requires both leadership at the community level and individual participation. Set aside time and space for rural women to familiarize themselves with both the technology and content relevant to their needs. Breaking this "virtual wall" that many rural women face is an important first step. The activity of e-mailing each other or finding local sources of information on the Web can immediately improve women's regard for the potential use of ICTs. Service and training delivery to rural women should be a group exercise so as to build community endorsement and interaction.

Use ICTs to connect the first mile, and work with "infomediaries" who are reaching women in a dynamic and learning-oriented approach. This is probably the most important project design factor of all. Consolidate and build on the work of existing activities and outreach of NGOs, women's groups, and associations that are already approaching their activities in a gender-sensitive manner. Applying an ICT platform to their main activities not only encourages ICT familiarity among both men and women, but also promotes transparency and accountability. A Cameroonian organization for women entrepreneurs, for instance, began to offer computer training classes to students, ensuring that equal numbers of girls and boys had access to the classes. It continued to run the microcredit arm of its activities, however, using traditional paper accounting methods instead of converting to computerization and mobile banking processes, which would have taken its ICT capacity up a notch and promoted accountability and accuracy within its microcredit program.

Conduct research into existing gender information systems and design ICT initiatives that build on these networks and that involve local participation. Don't assume that just because women are using ICTs, it means that they are empowered. There are numerous examples of women who earn income from selling cell phone services in a rural setting but who remain uneducated and do not access ICTs for lifelong learning. Be on the lookout for promoting ICT-related activities that increase women's household burden or that place them in debt. It cannot be assumed that community-based ICT initiatives will necessarily include women in the net of beneficiaries. In Sri Lanka, for instance, one pilot project was located next to a garage so that those who came to the garage for vehicle repairs would use the multipurpose telecenter; however, those who patronize the garage are men.[16] Careful planning, an ongoing commitment to addressing gendered barriers to access, and the collection of benchmark data from which to begin monitoring progress are critical.

Build local people's capacity to use technologies and information to improve their livelihoods (rather than focus on identifying uses for new technologies). Encourage community-driven initiatives that value indigenous information and promote local decision making. A danger exists that supply-side ICT solutions driven by donor expectations can

exacerbate development problems and gender differentials. Where ICTs have been successfully appropriated at the local level, one is likely to find a strong existing social network of users with similar interests or contexts or goals. Another way of looking at this is that individual access to ICTs does not ensure that the technology will be used by women for their empowerment. Rather, ICTs become advantageous to women when women are able to organize themselves around information that meets or addresses their specific needs.

In conclusion, technological and financial solutions to development problems are secondary to social solutions. The core solutions lie in building alliances, supporting dialogue, and enabling women to determine their choices, priorities, and "ways of doing and being." While incremental changes are being made, these changes are still patchy and not systemic. Women continue to be left out of key decisions concerning resource allocation and rural livelihoods.

THEMATIC NOTE 4

Sanitation, Hygiene, and Potable Water

Sanitation usually refers to the disposal of human excreta, but it may also involve wastewater and solid waste. Safe sanitation, better hygiene, and better access to potable water can greatly improve health and reduce health costs of families and nations. Diarrhea and acute respiratory infections are the two main causes of death of children. Hand washing can reduce the former by 40 percent, and research indicates that hand washing also prevents respiratory infections from spreading (Fung and Cairncross 2006; Shordt 2006). Other significant reductions in infections from improved sanitation, hygiene, and water supply include dracunculiasis, or guinea worm, disease (75–81 percent), schistosomiasis (59–87 percent), trachoma (up to 79 percent), and the worm loads from hookworm (26 percent) and ascariasis (60 percent) (Cairncross and Valdmanis 2006). Half of patients with HIV or AIDS get chronic diarrhea. Having access to a toilet, hygiene promotion, and enough water for hygiene enables patients to stay healthy and productive longer and lowers the work burden and negative development impacts (such as reduced school attendance) for the caregivers (Kgalushi, Smits, and Eales 2004).

Good sanitation, hygiene, and water supply are also priorities for women and girls because of harassment and the risk of rape linked to open defecation and the collection of water and firewood and because of their challenges in observing menstrual hygiene. Finally, improvements can also reduce time and energy spent walking long distances, especially for women and girls. Women often use time gains for economic work in agriculture, food processing, education, and community development. Improvements provide girls more time for schooling, especially when separate toilets for girls are also available (FRESH n.d.). The reductions in time and energy spent give women involved in agriculture and the informal sector more time for child care, rest, and social relations.

An improved water supply can further make it easier to use larger quantities of water, not only for domestic hygiene but also for domestic production: for example, vegetable gardening and food processing (usually by women), brick making (often by men), and animal raising (by both sexes, often with a gender division by animal type, type of work, and control over products and income). Higher levels of education and economic productivity are linked to improvements of women's status and gender relations (see, for example, Verhagen and others 2004), lower population growth, and more rapid economic development.

Despite the social and economic benefits they provide, investments in sanitation and hygiene still have a low priority, whereas the urgency to invest in safe water is now widely accepted. Investments in these three subsectors are still predominantly seen as social investments and not as critical for economic development because many international financial institutions do not perceive the opportunities to receive a return on investments in these areas. With the exception of some countries, the world is on track to meet the drinking water Millennium Development Goals target of halving the number of those without access by 2015, but the world is likely to miss the sanitation target by half a billion people (WHO-UNICEF Joint Monitoring Program 2006).

Initially, water and sanitation programs focused on women as beneficiaries and overlooked the necessity of their participation in the planning, management, and maintenance of community services. In contrast, men and boys were left out of hygiene programs. However, either sex has its own tasks, needs, and areas of decision making and control regarding water, sanitation, and hygiene. These vary with age, socioeconomic status, and family positions and culture and are subject to change over time. Lessons on effectiveness and sustainability have taught that both women and men must be involved in the planning, maintenance, and management of services and be involved in program agencies, and that men must also be involved in hygiene promotion to gain a better understanding of its importance.

KEY GENDER ISSUES

Equity issues come into play in important areas related to sanitation, hygiene, and potable water.

Equity in decision making

At the domestic level, men and women have different tasks, responsibilities, and authority in water supply, sanitation, and hygiene. Women household heads decide where and how domestic water is collected, stored, drawn, and used and also manage most of the waste, although some of the work may be done by daughters-in-law or children. Men family heads decide on larger domestic investments (such as a pump, tap, or toilet), and men household members handle men's work-related issues, for example, in construction. Both men and women often use potable water also for domestic production: women use it for horticulture, animal and small livestock keeping, brewing, and food processing, and men use it for large livestock keeping, brick making, and cash-crop processing. Sexes and classes may compete for water and waste as productive resources if these commodities are in short supply. Culturally, women and adolescent girls have the highest needs for improved excreta disposal facilities because of their greater demands for privacy and safety, their requirements for menstrual hygiene, and their greater safety risks. However, for health purposes, men, adolescent boys, and children should use toilets hygienically and consistently, and infants' excreta should be disposed of safely—aspects that often require special promotional efforts.

Gender and gender relations also affect management decisions at the community level. Both men and women generally ascribe existing community-level management of water and waste only to leaders who are men, often from the local elite. Women in general, poor women and men, and people from minority groups are less often represented on decision-making bodies, have less time and freedom to attend meetings, are under pressure to keep silent, and generally have less power to influence the ensuing decisions, their implementation, and their effects. Having women and poor people on local management bodies can be mere window dressing if they do not actually participate in meetings, make decisions, and see decisions carried out as intended.

Influenced by middle-class concepts of women as housewives and mothers who manage hygiene as an exclusive women's domain, hygiene improvement programs initially focused only on women and adolescent girls and bypassed men and young men. This led to an increase in women's workloads, whereas men's responsibilities for family health and hygiene—in construction and financing and in setting examples for and educating boys—were left out. Prevailing gender relations often made it impossible for wives and daughters to correct men's practices and for daughters (and daughters-in-law) to correct any beliefs, knowledge, or practices of their mothers (and mothers-in-law).

Addressing these constraints and involving the different groups in decision making ensure that the differences in knowledge, skills, and needs of the different types of actors are taken into account in planning and management decisions. Quantitative evidence from 18 completed water and sanitation projects in 15 countries revealed that more equitable participation in planning and management was positively and significantly associated with better sustained and used services (Gross, van Wijk and Mukherjee 2001; van Wijk-Sijbesma 2002). A review of the evaluation reports of 121 large rural water supply projects supported by multilateral agencies (26 percent), bilateral agencies (26 percent), and international and national NGOs (15 percent) showed that where women had been informed and participated in decision making, 12 out of 14 scores on project performance and impacts were higher (Narayan cited in van Wijk-Sijbesma 2002). However, very few evaluations have investigated the linkages between approaches for gender equity on the ground and the institutional changes and supportive policies that determine whether gender and development benefits will be sustained (Hunt 2004).

Equity in access to assets and opportunities

In four general areas of sanitation, hygiene, and potable water programs, equity of access is important for women and men: (1) information, education, and training; (2) infrastructure technologies, facilities, resources, and products; (3) finances and credit; and (4) functions and jobs.

Information, communication, and education are important elements in water, sanitation, and hygiene programs. For effective communication, a gender strategy is required because men and women differ in the type of information in which they are interested and in the information channels they use. Both women and men need information on and a choice of the various technologies and designs, because they deal with different technology-related aspects. Women, for example, have an interest in and knowledge of access and ease of use for women's needs, ease of cleaning, and children's use and safety, whereas men are interested in costs and appropriateness for men's uses. Furthermore, programs must take into account that men are more literate than women and that women and men with a higher status are more often literate than poor women and men. Men and

elite men and women also speak and read the national language more often, not just the indigenous language. People's access to mass media (newspapers, radio, tabloids, and TV) and the time they spend consuming these media also differ by, for example, sex, age, and class. In personal contacts, men tend to communicate with men and women with women on aspects related to their roles, responsibilities, and interests. Because water supply and sanitation projects are carried out by men technicians, who contact primarily leaders who are men, information and communication remain often limited to the elite who are men. However, with special strategies, poor men and women may also learn about plans, opportunities, and options and take part in decisions in planning and decision making. Hygiene promotion may especially reach better-off women and girls, although they need it least because of their better living conditions, education, and information access. Without equality on gender and for the poor, older men and adolescents, out-of-school children, the elderly, and poor women and girls may be reached least, even though young and adult men, children under 12, and the elderly are the groups with the lowest toilet use and frequency of hand washing.

Gender and other social constraints similarly affect access to training. Requirements to speak the national language, be literate, have time for training, and be able to travel make that training go mostly to men or to elite men and women. Because of gender stereotypes in communities and among program planners, managers, and staff, most often men (and often the more educated and younger men) are the people trained for technical, financial, and managerial tasks, whereas training on health and hygiene goes to women and adolescent girls, thus limiting equality in access, results, and benefits. Training only young men in maintenance and repair of water distribution points is, for example, not necessarily the best solution, because they do not routinely visit these points, have no personal interest in keeping them working, may only want full-time jobs and salaries, and, without specific arrangements, are not accountable to women users. However, it may be equally the case that not all women who live near water points and use them daily are suitable to receive the training, because they need enough time, freedom, recognition, capacity building, and compensation to do a proper job. The best experiences and results have been obtained with carefully selected, trained, and equipped women from low-income urban and rural households who as licensed plumbers and masons promote and install water connections, toilets, and rainwater reservoirs and work in latrine production centers. Trained local women have also been generally successful as financial managers. Training builds on their need for and commitment to paid work in their direct environment, contacts with other women, and the preference of both sexes to deal with women workers at times when men are away from home (van Wijk-Sijbesma 1998).

Access to physical facilities is not necessarily equitably distributed. Influence from the elite often results in water facilities being located on their land or near their houses. This gives them easier access to more water for consumption and hygiene and thus to better health. Their greater access to land, livestock, seed, credit, labor, implements, markets, extension services, and so on further gives better-off men and women better opportunities than poor people to use potable water and time and energy gains productively. In addition, such families can often make extra money by selling the cheap (often subsidized) water and products made from the water to the poor.

Ownership of toilets is also higher among higher-income groups, reflecting more space, higher education and incomes, and better access to information, credit, and subsidies. Self-construction with low-cost and free materials is an option for the poor but is hard for some groups, such as women household heads, people with physical disabilities, and the elderly. There are good examples of participatory allocation of subsidies with public transparency and accountability and of neighborhood and women-managed shared toilet and washing and bathing facilities, however. Biowaste that was once a free fuel and compost resource for the poor is increasingly lost due to recycling in biogas plants and eco-toilets. Improved hygiene also requires resources: more water, time for cleaning, new implements such as safe water-storage vessels, and soap for personal and domestic hygiene. This makes practicing good hygiene harder for the poor.

If gender constraints can be overcome, sanitation, hygiene, and water supply interventions offer good opportunities for women to become members and functionaries on planning and management committees, local maintenance workers and latrine masons, retail vendors of water, waste collectors and recyclers, hygiene educators, and program staff. The work often fits the existing gender-specific work of women, such as dealing with health and hygiene aspects, paying home visits, and communicating with other women. Women also already pay daily visits to water distribution facilities and with proper training are highly committed to keep them working through proper maintenance and sound financial management. Moreover, both women and men household members appreciate when women latrine masons work within homes and compounds in the absence of men, especially if high-quality work is delivered.

One final category requiring equitable access to sanitation, hygiene, and potable water is children and teachers in schools. Schools are places where many children gather. Risks of infection are therefore great and increase when children and teachers have no toilets or unhygienic ones, no safe drinking water, and no water and soap for washing hands after defecation and before eating. Schools offer opportunities for participatory hygiene promotion activities to instill hygienic habits in children and create links with hygiene improvements in children's and teacher's homes. Separate sanitation provisions for boys and girls in schools have encouraged parents to allow girls to continue attending school after the onset of puberty.[1] School programs further offer opportunities to discuss gender and poverty perspectives of sanitation, hygiene, and water supply and equitably share hygiene work among children and teachers without discrimination based on age, sex, ethnicity, caste, or class.

Equity in economic empowerment

Bringing potable water close to homes not only has important health benefits but also enhances opportunities for the economic use of water and time gains. This is especially the case in dry rural areas and seasons when women and children must spend long hours collecting water, and in poor urban and periurban areas with opportunities for related home industries, such as food processing, and urban forms of agriculture, such as market gardening and small-livestock raising. To ensure that especially poor women and men can use such opportunities requires careful planning. Additional resources and inputs are required for optimal benefits and to avoid conflicts between women and men and between different groups of women over sharing the available water. Water vending to homes is generally done only by young men and, other than for women and children who collect water for the household, always involves some form of transport. If these vendors are not taken into account, a water project may lead to the loss of such work and provoke vandalism against the new systems, especially when alternative employment opportunities are rare.

In sanitation, the recycling of excreta, various types of solid waste, and waste also provide opportunities for economic empowerment of women and men. For example, one year of urine from one person can support agriculture over an area of between 300 and 400 square meters. Calculations from the Stockholm Environment Institute (SEI) and the Centre for Low-Cost Drinking Water Supply and Sanitation (CREPA) in Burkina Faso show that poor rural women could save 7 euros per year in the cost of fertilizers by recycling urine (IFAD 2008). Some types of work related to recycling are done mostly by women at home, such as composting and productively using biodegradable waste, whereas in the collection and recycling of other resources, such as paper and plastics and scavenging of solid waste dumps, both sexes participate (see box 9.8).

The degree to which women and adolescent girls benefit from economic opportunities is highly dependent on the prevailing gender relations. Others in households, such as relatives who are men and mothers-in-law, may control how the women and girls in the family use their time and the products and income that they generate. In such cases, (younger) women may do the work but not share in the decision making about and the use of the resources they generate. Labor equality issues in the sanitation, hygiene, and water sector are common. Often, men most often get paid functions and jobs, whereas women are not involved or are expected to work as volunteers, or the women do the same work or work more hours for lower pay. Being more tied to the home, women are also more commonly found in the lowest-level committees and functions, whereas men have functions and jobs at higher levels with the accompanying power, income, and control.

An important effect of sanitation, hygiene, and water improvements is the reduction of risks and vulnerability. Well-planned and executed interventions can greatly reduce morbidity and mortality and the involved costs (Cairncross and Valdmanis 2006). Some of these risks are gender specific because they relate to types and places of work of women and men. For example, 75 percent of those blinded by trachoma are women because as main caregivers they are infected by infected children and have less access to health care than men (O'Connor and others 2004). Health and safety risks in informal solid waste collection and recycling can also be reduced while consolidating the economic benefits of the work (Cointreau 2006). Economic products and earnings also reduce risk and vulnerability by helping families endure the lean times of the year when income from cash crops dries up (Verhagen and others 2004). Improved water and sanitation further increase socioeconomic development because they enable children, and especially girls, to start and complete school. Reducing their water collection and excreta disposal burdens makes it possible for girls to go to school, and separate toilets for girls allow them to remain in school when they reach the ages of prepuberty and puberty (Burrows, Acton, and Maunder 2004).

Box 9.8 Brazil: Best Practice—Municipal Partnership for Income, Health, and Environment

Recife has 1.3 million inhabitants and the highest unemployment rate of urban Brazil. Poor drainage is aggravated by poor management of solid waste. Contamination of water by waste and incidence of WASH (water supply, sanitation, and hygiene)-related diseases are high, entailing high costs to households and the city. Through an innovative municipal partnership that provides gender-sensitive environmental and hygiene education, people learn to separate recyclable materials at the source and to donate them to groups, cooperatives, and community-based organizations (CBOs) of men, women, youth, and children, who collect, sort, and sell waste for a living. Four interdependent projects operate in an integrated manner: (1) the Voluntary Delivery Spots project, with 40 containers for the segregated collection of recyclable goods in high-income neighborhoods; (2) the Communal Selective Collection project, in which women in households and women's groups in middle-to-low and low-income neighborhoods exchange separated waste for food, meal tickets, or construction material for a communal building; (3) the project Support to Selective Collection by the Informal Sector for the street pickers, cart pullers, and rag pickers at the main city dump, in which CBOs helped establish four pickers/pullers cooperatives in an effort to promote more hygienic collection and sorting methods; and (4) a project to upgrade the 60 hectares around the main city dump in the municipality of Jaboatao dos Guararapes.

Positive effects of the dump pickers' project are an increased number of participants, reduced direct contacts with contaminated garbage, a reduced number of dump sites, an improved urban environment, and cost savings in waste collection. The projects gave a 73 percent increase in recycled materials in two years, a 62 percent annual increase in the volume of material for recycling, a 482 tons/month reduction of solid waste, a 56.5 percent reduction in special operations for solid waste collection, a reduction in the number of dump sites from 285 to 124 (a 43.5 percent reduction), a reduction in the amount of garbage collected by 5,796 tons/month, and an extension of 5 to 20 years of the life of the dump site.

Sources: Arrais 1996.

LESSONS LEARNED AND GUIDELINES FOR PRACTITIONERS

In national and international policies and programs, expanding the supply of potable water services still receives a much higher priority than the improvement of sanitation and hygiene. Yet the three are very complementary. Improved sanitation and hygiene are even more important than improved water supply, except when the old source of water is more than a 30-minute round trip away or when connections to the home are provided. The choice also fails to reflect that women have a higher priority for improved sanitation than men and that well-planned and executed investments in hygiene promotion are highly cost effective for achieving better public health (Cairncross and Valdmanis 2006). Therefore, it is crucial to raise the priority level of sanitation and hygiene improvement in national policies and investment programs (see box 9.9 for an example of best practices).

Within the human aspects, gender and gender-equity aspects in policy and strategy documents are still often limited to a few paragraphs on women and their involvement (Appleton and Smout 2003). The remaining text contains gender-neutral language, such as *people, users, committee members, staff,* and *leaders* whenever referring to people. Gender mainstreaming means being specific on the "who" question, distinguishing not only between women and men but also between women and women and between men and men of different ages, economic, racial, ethnic, and cultural categories to end exclusion and discrimination of the disadvantaged. A simplified gender analysis tool (see box 9.10) has been instrumental in distinguishing and detailing gender and poverty in policies and strategies and in monitoring and evaluation.

Qualitative and quantitative research has shown that, along with good facilitation and support, the following characteristics are important for successful community water supply and sanitation: a more informed and democratic say for the different groups of women and men in the kinds of facilities that they will use and are able and willing to support; a greater and informed choice of the different interest groups in the local types of maintenance,

Box 9.9 India: Best Practice—Policy

Few countries have a special policy on sanitation and hygiene. India is one exception. In 2001, it published the "Guidelines for the Central Rural Sanitation Programme Total Sanitation Campaign." With regard to gender division, women are mainly seen in their traditional roles as housekeepers and mothers and not as, for example, trained and paid latrine masons and solid waste recyclers. The latter functions would relate closely to the already common daily labor of poor women as mason helpers and waste collectors. The guidelines do, however, allocate funds for separate school toilets for girls and for women's sanitation blocks (for example, when space for household toilets is lacking). It also states that "it is essential to train the community, particularly *all the members* of the family in the proper upkeep and maintenance of the sanitation facilities" (emphasis added; Government of India, Ministry of Rural Development, Department of Drinking Water Supply 2001). Implicitly, the guideline stresses that hygiene work in the home, which increases after toilet installation and hygiene education, should be shared between women and men, boys and girls. Not addressed are (1) how lower rates of literacy among women and gender differences in responsibilities, interests, concerns, and communication channels affect information, education, and communication (which gets 15 percent of program funds); (2) training for women (technical and social); (3) health and hygiene education for men; (4) giving women an informed choice in choices of technologies and design of facilities; and (5) gender balance in community management of sanitation and hygiene. See also www.genderandwater.org/content/download/307/3228/file/ GWA_Annual_Report.pdf.

Source: Government of India, Ministry of Rural Development, Department of Drinking Water Supply (2001).

Box 9.10 Simplified Gender and Poverty Analysis—the "Who" Question

- *Work:* Who does which work (such as physical, organizational, and intellectual): men, women, both? Poor women, men? Any patterns of discrimination?
- *Resources:* Who gets resources (such as water, waste, information, training, and credit): men, women, or both? Poor men, women? Any patterns of discrimination?
- *Decision making:* Who makes decisions at which levels: men, women, both? Poor men, women? Any patterns of discrimination?
- *Control:* Who has control over choices, resources, products, and income: men, women, both? Poor men, women? Any patterns of discrimination?
- *Benefits:* Who gets which benefits (such as facilities, services, jobs, and payments): men, women, both? Poor women, men? Any patterns of discrimination?
- *Losses:* Who loses work, resources, influence, control, benefits: men, women, both? Poor women, men? What are or may be the impacts for the people and the services?

Source: Indonesian Sanitation Sector Development Program, internal document.

management, and financing systems; and locally chosen and trained representatives of the different stakeholder groups dealing with management, including accountability to users (van Wijk-Sijbesma 2002).

Typical participatory planning issues requiring consultation and informed and joint decisions include the type of technology and, in the case of a water supply or sewerage system, the level of service (private, shared, or neighborhood facilities); the numbers, designs, and locations of the facilities; local arrangements for maintenance, management, and financing; needs and arrangements for capacity building; and arrangements for accountability and prevention of corruption (Mathew 2006). Practical measures (see table 9.7) help give local women more equitable participation and influence in environments in which gender inequalities and technical bias favor men's participation to the exclusion and subordination of women (Coates 1999).

For effective promotion of hygienic conditions and practices, different strategies can be adopted. Social marketing is one option to promote one particular product or practice, such as the installation and use of an affordable toilet, washing hands with soap at critical moments, or the solar disinfection of drinking water. It is also possible to develop programs for more comprehensive behavior change and to build capacities in communities to plan, implement, and manage their own hygiene and sanitation program, for example, for total sanitation (Austin and others 2005, Kar and Pasteur 2005). In each, strategy measures are needed to

Table 9.7 Ten Steps to Enhance Women's Participation in Projects at the Community Level	
1	Contact men's leadership for understanding and support
2	Use information channels that reach women
3	Facilitate women's participation in project meetings: • Help women speak out (use vernacular language, discussion breaks, and spokeswomen) • Hold meetings at times and places suitable for women • Hold separate meetings with women when necessary • Inform women and men and invite both to attend (for example, as couples) • Make seating arrangements appropriate to women (to avoid having them sit in the back)
4	Involve women in local planning and design decisions about the following issues: • Capacity building, including for innovative jobs and positions • Choice of committee members and their tasks and accountability • Choice of local caretakers, operators, mechanics, and their tasks and accountability • Choice of technologies and designs and locations of facilities • Local financing system • Local management system
5	Enable women to choose their own representatives for trust, ease of contacts, leadership capacities, and feasibility
6	Ensure representation of women on higher-level committees and bodies
7	Help create new roles and jobs for women related to their gender interests and tasks: • Comanagers of water, sanitation, and hygiene services and programs • Construction of facilities in the home environment • Maintenance and repair of facilities • Promotion of hygiene among women (men promoting hygiene and hygiene support by men) • Tariff collection and financial management
8	Link water, sanitation, and hygiene projects and programs with income generation opportunities, especially for poor women (and men)
9	Train women in technology and management, and train men in hygiene and hygiene promotion and ensure that they can apply the training
10	Have mixed women-men project teams for technical and social aspects and train teams and management on reasons for and modalities of gender equality

Source: Based on Wakeman 1995: 77.

ensure that the gender and gender-equity aspects of hygiene and hygiene promotion are incorporated for effectiveness and sustainability and as a human right.

At the agency support level, a first condition for mainstreaming gender equality is understanding and recognizing gender and gender factors in the broader sense: looking at positions, roles, and relations differentiated not only by sex but also by age, ethnicity, race, caste, class, religion, and marital status. Work toward gender equality should be one of the explicit objectives of all sector agencies. Because of the multidimensional nature of the sector, having a mix of men and women technical and social specialists is essential, either within single implementing agencies or through cooperation between technical and social organizations, such as engineering firms and NGOs. However, mixed staffing is not enough by itself. To be effective, both technical and social workers (and, where relevant, environmental and other specialists) should have a basic knowledge about each other's working areas and their gender and gender-equity aspects, operate as teams and not in parallel, and have managers who demand, appreciate, and reward gender-equity approaches.

Gender training and gender specialists and consultants can be helpful but can also make others think that the issue has been taken care of and that mainstreaming has been achieved. In practice, mainstreaming is an ongoing way of thinking and a continuing process for which all are responsible. The investigation of gender knowledge, skills, and practices, therefore, deserves to be part of the job descriptions, recruitment processes, and performance assessments of all staff and managers. For an example of best practices in human and organizational capacities, see Innovative Activity Profile 1 on sanitation in Kerala, India.

Mainstreaming also involves making gender and gender-equity aspects part of the organization's documentation and reporting and part of the development, testing, institutionalization, and periodic upgrading of project and program procedures. Budgets should contain

clear evidence of gender inclusiveness by including funds not only for gender training and consultancies but also for designing, implementing, monitoring, and evaluating new and more equitable gender roles for women and men in projects and programs. In-house gender equality is further reflected by a balance in men and women staff and career paths, equal salaries and benefits for equal work, and working conditions that make taking care of family responsibilities easier for both sexes.

MONITORING AND EVALUATION

Which indicators and sources of verification are chosen depend on the level of the work (for example, policy, support organization, or implementation), the stages of the project cycle, and the type of projects and programs (sanitation, hygiene, water supply). Table 9.8 gives a number of possible indicators and their means of verification. Ideally there should be a mix of quantitative and qualitative indicators. Depending on the country or region and the aspects considered, it will be relevant to look especially at particularly sensitive categories, such as the poorest women and men, members of minority groups, and daughters-in-law and single women and men, because of their less acceptable situations and opportunities regarding workloads, resources, influence, control, and so on.

Because numbers do not indicate actual participation in processes and decisions, a sliding-scale system may be used to assess the degree of gender mainstreaming, for example, in decision-making bodies and meetings: only men are members; women are members but do not attend decision-making meetings; women attend but keep silent; women attend and express themselves but are not heard; women attend, express themselves, and influence at least one decision; women attend, express themselves, and influence most and finally all decisions (Mukherjee and van Wijk 2003).

Table 9.8 Monitoring and Evaluation Indicators for Gender Equity in Sanitation, Hygiene, and Water

Indicator	Sources of verification and tools
Participation of the national women's institutional framework, women NGOs, and/or gender specialists in the formulation and review of sector policies	• Interviews with policy makers • Minutes of policy planning meetings
Presence (incidental or systematic) and nature of gender (women's participation or gender equality) in policies	• Review of policy documents
Percentages, cooperation, and working relations of women and men technical, social, and support staff in agencies and projects, by level	• Interviews • Staff data
Percentage of budgets earmarked for gender capacity building and for activities related to gender, and the actual expenditures	• Financial records • Project/program budgets
Percentage of women and men active on planning and management committees at different levels, including disadvantaged women/men, over time	• Participatory survey • Program and project records
Distribution of projects over poorest, poor, less-, and least-poor communities in project or program area	• Ranking of communities by welfare mix • Welfare classification (Participatory Rapid Appraisal [PRA]) technique by community
Distribution of access over time to improved water supply, waste disposal, and hygiene education/facilities over poorest, poor, less-, and least-poor households in project communities	• Participatory survey with welfare classification and access mapping (PRA) • Program and project record
Functionality of facilities and services over time and degree and purposes of use by sex and age in the different user groups	• Group interviews and focus group discussions • (Participatory) household survey • Project/program data
Percentage of women and men trained over time in agencies and communities for technical, social, managerial, financing, and hygiene work, including disadvantaged women and men, and experiences with application	• Interviews with stakeholders • Participatory survey with matrix counting • Program and project records
Measured or perceived positive and negative impacts of the interventions on time and water use, hygiene conditions and practices, work, positions, knowledge, skills, resources, capacities, incomes, and health of women and men in different age, socioeconomic, and cultural groups	• Changes according to group interviews and focus group discussions • Prestudies and poststudies
Community satisfaction (disaggregated by gender, class, caste, and so on) with project and program processes, implementers, and changes	• Group interviews and focus group discussions • Interviews, before and after

Source: Author.

INNOVATIVE ACTIVITY PROFILE 1

Peru: Rural Roads Project, Second Phase

The first phase of the Peru Rural Roads Project was implemented between 1995 and 1999 in 12 departments that ranked highest in rural poverty, primarily in the highlands and in one jungle area. Among the poorest are indigenous people, the majority of whom live in the highlands.[1] The second phase, implemented in 2001–06, focused on the same 12 departments and emphasized creating development opportunities with an emphasis on inclusion and equity, particularly for indigenous women (World Bank 2007). The third phase, the Decentralized Rural Transport Project (2007–12), will scale up the program to the entire country, with an emphasis on social inclusion and participatory democracy.

The focus of this Innovative Activity Profile is the second phase, which was assessed by the World Bank Quality Assurance Group and the Independent Evaluation Group as a highly satisfactory and highly efficient project[2] that establishes a "new demand-led paradigm for transport planning and development" (World Bank 2007: 39) and is a "pioneer" in developing performance indicators. The project also received awards for excellence from the World Bank and the NGO community in Peru (World Bank 2007). Recognizing that "women are a driving force in poverty reduction," the project used innovative, participatory approaches to mainstream gender in ways that increased the impact and sustainability of the investment and empowered poor rural women (World Bank 2007). The project is supported by loans from the World Bank and the Inter-American Development Bank (IADB). Phase two investments include $50 million each from the World Bank and the IADB and $51.21 million from the government of Peru.

PROJECT OBJECTIVES AND DESCRIPTION

The project development objective for phase two was to "improve the access of rural poor to basis social services, market integrating infrastructure, and income-generating activities with gender equity to help alleviate rural poverty and raise the living standards of rural communities" (World Bank 2001: 2). The specific objectives were to integrate poorly accessible zones to social services and regional economic centers, generate employment in rural areas, and strengthen local institutional capacity to manage rural roads on a sustainable basis and launch community-based development objectives. The project used local labor for road and nonmotorized transport track rehabilitation and established local microenterprises for road maintenance, with oversight by community-based road committees. A local development window (LDW) assisted communities in planning, skill development, and seeking funding to support local development projects once road or track access was established.[3]

The project design responded to the important economic roles played by rural women and the need to help them overcome constraints on their productivity and mobility, including heavy domestic and time burdens (accessing fuel and water), low literacy, language barriers,[4] cultural barriers to their use of public transport, limited control of household resources, and limited voice in planning of previous transport initiatives, as well as isolation due to lack of adequate transport infrastructure (World Bank 2001). Combined with these factors are high rates of woman-headed households and migration by men (Gutiérrez 2007; JICA 2007).

What's innovative? Key to the success of the project was the participatory, inclusive design and implementation with interconnected, complementary, gender-informed initiatives: microenterprises for road rehabilitation, the development window, and strengthening local governance.

Although gender was not incorporated in the project design for the first phase, a study of gender-differentiated impacts of road rehabilitation was commissioned and revealed differences that spurred a gender focus in the second phase. A gender training workshop for staff of the implementing agency, carried out during the interface between phases one and two, used the study findings to illustrate how gender issues cut across road rehabilitation activities in the project. The social assessment for phase two addressed gender issues; the stakeholder analysis and outreach strategy identified women as a vulnerable group and called attention to the risk of low participation of women in road maintenance microenterprises and rural road committees.

Technical assistance missions from the World Bank assisted the project implementation unit in developing a matrix defining specific gender targets and follow-up actions for the implementation phase. Assistance was also provided to conduct a gender analysis of the project's operational procedures and develop a gender action plan. The key elements of the gender action plan included equal opportunities for selection of women and men as microenterprise workers (revision of selection criteria to avoid exclusion of women), promoting gender equity in operational procedures (revision of the operational handbook), creation of rural committees that included women's group representatives, definition and monitoring of gender indicators and gender focal points in central and field staff, and gender training. No specific human or financial resources were allocated to gender in the project design, but there was flexibility to rearrange budget lines to target money and staff time for gender actions.

The implementing agency, Provias Descentralizado, hired a Peruvian gender consultant to guide the institutionalization of gender in Provias's operations. Under her guidance, Provias created a structure to address gender issues, including a gender coordinator and regional focal points, and developed a gender training program for managers and field staff, evaluated barriers to women's involvement in microenterprises for road maintenance, and developed and monitored gender-related indicators throughout the project cycle.[5] Gender equity was part of Provias's policy. Training for road operators on rehabilitation and maintenance of roads reached 1,018 participants, 35 percent of whom were women, and reached 11 percent of the direct beneficiaries.[6] Engineer monitors assisted in the nonmotorized transport and road rehabilitation (Caballaro and Alcahuasi 2007a; Forte and Menedez 2005; Gutiérrez 2006).

Community consultation workshops were organized in villages affected by the project. Separate sessions for women and men were convened to ensure that women were able to talk freely about transport needs and constraints. In response to local needs, particularly women's, the project rehabilitated 3,465 kilometers of nonmotorized transport tracks. The nonmotorized track rehabilitation involved the most vulnerable and excluded parts of the rural population in the planning process. These tracks proved to have a greater impact on economic growth and the roads, in part because they connected previously isolated communities with markets.

The LDW implemented a rapid rural poll, differentiated by sex, age, and economic status, to help ensure the inclusiveness of the participatory process, particularly for women. The LDW developed a network of strategic partnerships between civil society, government, and donors, built planning and fund-raising capacity and initiatives at the local level, and empowered women and communities to improve their lives (Dasso 2005). The LDW took into account women's needs, which resulted in the strong participation of women in the identification and implementation of entrepreneurial activities, as well as rural roads committees and cooperatives. Examples of projects include fish farming in Sauce Lake, benefiting 150 families, and production of organic, aromatic medicinal plants (Caballero 2007b; World Bank 2007).

GENDER APPROACH

Through a learning process over 10 years, the Peru Rural Roads Project has established a new, inclusive, demand-driven paradigm for transport planning and economic development (World Bank 2007: 39). Critical elements of this paradigm include participatory, inclusive project design and implementation; gender-informed project activities; the design of a set of interconnected, synergistic elements (rural road rehabilitation and maintenance, local microenterprise; LDW, and strengthening local governance capacity); and gender-sensitive monitoring and evaluation that informs the project. Involvement of the NGO Caritas and its local affiliates was very important in the inclusion of women in the project.

Gender equity in road maintenance

Gender equity in the performance-based contracting microenterprises for road and track maintenance was accomplished by modifications in the project operating manual requirements that recognized women's agricultural

experience and roles as household managers and leaders of women's organizations as qualifying criteria and that dropped the literacy requirement. Gender awareness and quality of work were incorporated into the training. The participation of women in road maintenance was resisted at first, but the project prompted social change. After five years of women's participation, they proved themselves to be efficient and were able to overcome the initial gender stereotypes.[7] A new perception of women characterizes them as valiant, hard working, entrepreneurial, honest, and not corruptible (World Bank 2006b). Women's membership in these enterprises (24 percent) exceeded the requirement for 10 percent women.

Gender equity in the local development window

The LDW enhanced social capital and fostered community participation with a clear gender focus, which empowered women through 40 percent women's participation in local development initiatives (IBRD/IADB 2005). The LDW can serve as a coordination model that facilitates decentralization. It has established a decision-making mechanism from the bottom up that stimulates the empowerment of local men and women producers to decide their own future (Dasso 2005: 72).

Inclusive strengthening of local governance

Local Road Institutes worked with municipalities to develop strategies for road rehabilitation. Road committees approved the roads and tracks for rehabilitation, assigned tasks, paid wages, and organized the contribution of labor. The project required 20 percent of the members of road committees to be women. Thirty percent of the members elected by their communities, with Caritas guidance, were women.

Gender-sensitive monitoring and evaluation

Provias, the project-implementing agency, has continued to be a learning organization, based on performance monitoring. A social and impact monitoring system clarified the expected gender-differentiated outcomes and how different local realities might affect women's participation in project activities. The project team also developed gender-related indicators that were tracked throughout by the gender coordinator in Provias. Women's participation in maintenance microenterprises was monitored to ensure there was no bias against them. A gender impact assessment was conducted at the end of phase two.

BENEFITS AND IMPACTS

The project has increased income and household food security from roadwork and other microenterprise initiatives for women and men. It reduced travel time for women and men by up to one-half; rehabilitation of nonmotorized tracks significantly reduced the multitask burden of women, which reduced the opportunity cost of their time and increased their productivity and mobility choices. Seventy-seven percent of the women surveyed said they traveled more, and 67 percent said they felt they traveled more safely. Cleaner, safer tracks encouraged them to travel to sell agricultural products, obtain name registration,[8] deliver their babies in health centers, and participate in community meetings. Girl's access to primary education increased by 7 percent.

As a result of the project, 100 community organizations engaged in local development activities, and 500 microenterprises performed routine maintenance on roads. This created 6,000 one-year-equivalent unskilled jobs, 24 percent of which were held by women, which exceeded the 10 percent quota established in the gender action plan. Twenty-four percent of the members of rural roads committees were women, and 42 percent of the rural roads committee treasurers were women.

Women provided pragmatic input into project design, such as the request for rehabilitation of tracks, which had more impact on poverty alleviation than on the road rehabilitation. Women's participation has increased the efficiency, quality, and transparency of road maintenance microenterprises (World Bank 2007: 86). Women were more trusted because they were viewed as "incorruptible." They were more reliable in managing income because they were more transparent in accounts management and viewed corrupt practices more negatively than did men. They were more effective at negotiating payments and trusted to ensure that the quality of the work met the agreed technical standards. Women gained trust among their colleagues by doing a reliable job in managing funds, and they gained respect by motivating the team to achieve quality in road maintenance. Men stopped drinking during roadwork and took fewer breaks. Women also served as treasurers in 42 percent of the road committees, ensuring transparency.

Women's increased productivity contributes to overall economic growth. Women's income improves nutrition and increases education of children. The participation of women also had a positive impact on the efficiency of entrepreneurship activities generated through the local development window (Caballero and Alcahuasi 2007a; World Bank 2007: 84).

LESSONS LEARNED AND ISSUES FOR WIDER APPLICABILITY

- *Including gender equity within the project development objective* was the single most important element to justify the allocation of human and financial resources for gender activities.
- *Institutionalizing gender mainstreaming in the implementing agency is important.* The inclusion of the gender perspective in the agency was one of the keys to the success of the project. Building on existing human and institutional resources enhanced capacity to carry out sustainable gender actions. Social scientists in the project were eager to take on the gender work as a way of gaining leverage within the project. Participation of this staff in the design of the gender action plan enhanced their capacity to conduct gender analysis and established their ownership of the plan.
- *Institutional support for gender from donor agencies and the project implementation unit was crucial.* The World Bank missions sent a clear message that gender was important and allocated resources for gender activities. In the project implementation unit, the director supported the efforts of the gender focal points to put in place mechanisms to implement the gender action plan.
- *Gender champions are crucial for raising awareness of gender issues over time and contributing to sustained gender work.* Gender expertise was developed by the gender focal point in agency headquarters and the consultant hired to design and monitor the project's gender agenda. Staff and beneficiaries also helped mainstream gender in Provias's operations (Caballero and Alcahuasi 2007a). The Social Development Staff member in the World Bank Resident Mission played a key advocacy role throughout the life of the project, maintaining the momentum on the gender work by raising the gender issue to task managers and project implementation unit staff (Ruiz-Abril 2005).
- *Coordination of road rehabilitation with local productive activities can stimulate development and improve the efficiency and effectiveness of the rural roads project.* The local development window, implemented by a large national NGO, helped identify synergies between areas for productive growth, create linkages between local service providers, and coordinate access to key financial services in areas where the transport conditions were improved (Valdivia 2007; World Bank 2006a, 2007: 41).
- *Participation of the local population at all stages of the project is key to increase impacts and ensure the sustainability of investments* (Provias comment; World Bank 2007: 44). Community participation played an important role in the development of the project by providing guidance and advancing local development goals. Ensuring that women have an opportunity to express their needs during the participatory planning process is particularly important. This often requires separate discussion groups for women and meetings held in indigenous languages (Dasso 2005).
- *Management capacity building is crucial to guarantee a long-term impact on gender equity and the sustainability of gender know-how.* Identifying women leaders and ensuring their participation in training workshops could have been further developed (World Bank 2007: 89).
- *Local women's organizations can be excellent allies in fostering rural development and women's empowerment.*
- *Selecting a good partner is essential.* Building partnerships is not an easy task. It requires rules of engagement; standards for agreement; clear objectives; precise conditions, roles, and functions; a balance of contributions from the parties; and, most of all, trust.
- *The local development window requires systematization to expand and replicate it elsewhere in Peru.* Guidelines are needed on the contents, methodology, and process for implementing the LDW, combined with training workshops (Dasso 2005). An organized project funding logic is needed as well. A need is present for diversification and use of local productivity chains (IBRD/IADB 2005).
- *Gender-sensitive monitoring is very important to ensure that the gender action plan is implemented and to inform and improve the next phase of the project.* Comprehensive measures of direct and indirect effects of rural transport services and induced economic activities on women's welfare and access to income-generating activities are important. It is also important to measure the value added from women's participation. If performance measures for road maintenance activities had taken the quality of work more into account, it would have provided more evidence of the value added by women's participation (World Bank 2007).

INNOVATIVE ACTIVITY PROFILE 2

Malaysia: Community E-Centers

Malaysia provides an interesting example of overall rural telecommunications access. The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and Malaysia's Institut Tadbiran Awam Negara (INTAN) have compiled an online how-to guidebook on setting up and running a community e-center (UNESCAP 2006). The guidebook chronicles the experiences of three rural projects in Malaysia (Rural Internet Centre, Medan InfoDesa, and eBario Project),[1] using their successes and failures to inform community groups interested in setting up their own center. Community e-centers (CeCs) are public-access facilities that provide electronic communication and multimedia services. The long-term goal is to reduce poverty through increased digital literacy and greater control and access to ICTs.

Telecommunications access in rural areas is best provided in a community center that is open equally to men and women. In recent years, a number of CeCs have been piloted worldwide, but very few are successful, because most of them are not financially sustainable and do not really engage directly with the community. The community e-centers case studies presented here have some good practice guidelines because they address sustainability issues from the standpoints both of financial viability and of community engagement and participation.

What's innovative? Community e-centers provide electronic communication services, especially in marginalized or remote areas where ICTs are not prevalent. The centers serve as avenues for providing universal-access communications and multimedia services to rural communities, including telephones, faxes, computers, the Internet, photocopiers, and other equipment and services. One of the innovations is the focus on people and not just on technology.

CeCs can have several functions. They will enable the communities to access new knowledge and information that can be incorporated into their local knowledge and context, such as information on employment opportunities, educational resources, government services (for example, providing links to e-government), and technical information on agriculture for their daily lives, such as information on new varieties of crops, planting techniques, and disease prevention. The CeCs may also be used as training centers for local people to learn and practice their computer and ICT skills, to provide access to distance education (e-learning), for human resource training, and for business ventures. The CeCs can also allow entrepreneurs to plan and prepare their business arrangements and to communicate with partners and potential clients from a distance (e-commerce).

Through the Internet students and educators can register with educational institutions at any location in the world, access archival materials, or receive online instruction. CeCs can also serve distance education to students by providing educational software packages on site and upgrading them as new educational packages are produced.

Specialized services can also be offered to health care workers, enabling them to use telediagnostics programs, order supplies, convey public health information, and obtain specialist advice for complex health problems. In this respect CeCs serve as "virtual roads" or communication highways that can benefit the society.

GENDER APPROACH

The online *eSourcebook* has mainstreamed gender considerations throughout. It lists equity-oriented questions that should be answered in the planning, monitoring, and evaluation stages. Questions challenge communities to articulate

the different groups' needs and constraints so that they can be met and mitigated, to identify which groups will be empowered by the CeC, to outline how gender equity can be achieved through hiring and hours of operation, and to assess which types of technologies are most appropriate. The guidebook suggests not only monitoring ICT use on an ongoing basis but also keeping records of the distance people traveled to the CeC and their mode of transportation. Evaluation of the CeC's contribution to the overall socioeconomic development of the community is recommended. Such gender mainstreaming increases the potential for benefits accrued to rural women and minimizes the constraints they face.

BENEFITS AND IMPACTS

The short-term benefits of the three CeC case studies included the provision of ubiquitous, affordable, equitable, and quality access to ICTs. Before the eBario project began in 1999, 90 percent of villagers had never used a computer. Now the community is world renowned as an innovative community en route to bridging the digital divide. The project has spurred a local tourist industry, resulting in the creation of new job opportunities. These new opportunities have encouraged youth and young families to remain in Bario and consequently have decreased the rates of rural-urban migration. The project's Web site enabled local producers to sell their food products and handicrafts online. There are broader political ramifications: the Malaysian government has become sensitized to the potential of ICT-induced rural development and is supporting other villages to set up CeCs.

LESSONS LEARNED AND ISSUES FOR WIDER APPLICABILITY

Based on the case studies, the following factors are essential to the success of the CeCs:

- *Focus on people, organization, contents, and processes rather than technology.* The key to success is very much a focus on the very people the CeCs are targeting. For CeCs to work, a proper organizational structure needs to be put in place. Technology implementation is generally the easiest component to implement.
- *Relevant to local needs.* The CeC's existence and sustainability are tied to the capacity of CeCs in meeting the actual needs of the community. Applications and services of CeCs should be driven by the needs of communities (demand driven).
- *Community participation. The* members of the target community of the CeCs must participate in the whole process of setting up the CeCs. They are not only the ones who are aware of the needs of the community, but also the ones who will be managing the CeCs in the long run because NGOs, government bodies, and sponsors may be able to assist for only one or two years.
- *Roles of local champions.* In the Malaysian context local champions of the case studies are a key component in the success of the CeC. These local champions are passionate about helping their community to improve. These local champions act as catalysts and motivators to the project and persevere through setbacks.
- *Smart partnerships.* Partnerships among various stakeholders are required throughout the process of the development of a CeC. Stakeholders include governmental bodies (which provide approvals, funds, and advice to NGOs), NGOs (which provide human resources and training to private companies and the community), private companies (which may assist in the forms of sponsorship), and the community that will be affected by the project, to name a few. In the case of eBario, in addition to Universiti Malaysia Sarawak (UNIMAS) and the Bario community, which were the main organizers of the project, other partners included the Marudi District Council (which provided approvals and the premises), government ministries, NGOs, and private companies (Comserv and Telekom Malaysia).
- *Training programs.* As the community will be using and running the CeCs, the community must be prepared to be able to use and run the CeCs effectively and efficiently. Skills, such as management skills, computer literacy, and maintenance skills, are essential to the continued operation of the CeCs.
- *Business plan.* CeCs that intend to be financially independent must have a business plan. The business plan provides a description of the organization, the objectives of the CeC, how the objectives are to be achieved, the market of the business, financial forecasts, and earnings targets.

Although CeCs may start out with external donor funding or a grant and may rely to a large extent on volunteer support, their goal is always to be able to generate adequate revenue through the provision of services and, eventually, to become self-sustainable. To achieve this goal, the multipurpose CeCs need to be managed well and provide services that are in demand, because even CeCs that are nonprofit entities need to be financially viable to be successful. Key factors

that have enabled successful CeCs to become sustainable include the following:

- *Community ownership is crucial:* organizational structures should provide authority, responsibility, and management of resources to the community.
- *Locally relevant content/services should be designed and implemented to suit the needs of the community.*
- *Technology options that provide affordable and universal local connectivity, including the use of multimedia (radio, video, TV, and the like), must be carefully examined.*
- *Financial and operational sustainability needs to be obtained over a period of time.* Sustainability has other dimensions beyond self-financing, such as the social, cultural, political, and technological arenas. Social and cultural sustainability is measured by whether it empowers people in the community, meets the needs of various groups (men and women, young and old), and allows for community ownership and engagement. Political sustainability is measured in terms of whether a stable regulatory framework to promote and support CeCs has been secured. Technological sustainability is measured in terms of whether appropriate technology options were chosen for the community. Financial sustainability indicates whether a CeC is fully or partially viable, whether it can recover its capital investment, operational expenses, and replace equipment as needed or can recover only operational expenses but not the initial and future capital investments.

NOTES

Overview

This Overview was written by Dominique Lallement (World Bank) and reviewed by Mari H. Clarke, Rekha Dayal, Catherine Ragasa, Christine Sijbesma, and Nidhi Tandon (Consultants); Clare O'Farrell (FAO); Moses Abukari, Rudolph Cleveringa, Maria Hartl, and Audrey Nepveu (IFAD); and Nilufar Ahmad, Indira Ekanayake, and Eija Pehu (World Bank).

1. This Module uses the term *agricultural development* to include crops, forestry, livestock, fisheries, land and water, agroindustries, and the environment (see *Sourcebook* Overview).

2. According to a UNIDO and International Fund for Agricultural Development project cited in Blackden and Wodon (2006).

3. R. Srinivasan, "Stealing Farmers' Water to Quench Chennai's Thirst," InfoChangeAgenda, March, www.infochangeindia.org.

Thematic Note 1

This Thematic Note was written by Mari H. Clarke (Consultant) and reviewed by Dominique Lallement and Catherine Ragasa (Consultants); Moses Abukari, Rudolph Cleveringa, Maria Hartl, and Audrey Nepveu (IFAD); and Indira Ekanayake and Eija Pehu (World Bank).

1. The specific nature of men's and women's transport tasks varies by country, socioeconomic status, age, ethnic group, location, household livelihood strategies, and other factors.

2. Obstetric fistula is a hole that forms between the vagina and the bladder or the rectum as a result of prolonged (an average of 3.8 days) and obstructed labor of young, often teenage, mothers. This is prevalent where teenage marriage is the cultural norm and access to emergency obstetrical care is limited (Riverson and others 2005).

3. For example, because of safety issues related to women's travel after long hours in agroprocessing work in Guatemala, a company provided dormitory housing for women during peak processing periods (Dolan and Sorby 2003).

4. Reidar Kvam, personal communication, 2007.

5. Access has two components: (a) mobility, meaning the a ease or difficulty of travel to a service or facility and (b) proximity of the services and facilities.

6. An all-season road is passable year-round by the prevailing means of transport (typically a truck or four-wheel-drive). Occasional interruptions of short duration are accepted. All-season access is less than 40 percent in sub-Saharan Africa and the Middle East and North Africa (Roberts, Shyam, and Rastogi 2006).

7. International Labour Organization (ILO), "Asia Pacific Integrated Rural Accessibility Planning," Second Expert Group Meeting, September 5–6, 2000, Bangkok, www.ilo.org/public/english/employment/recon/eiip/download/ratp/ratp08.pdf.

Thematic Note 2

This Thematic Note was written by Dominique Lallement (World Bank) and reviewed by Elizabeth Cecelski (Consultant); Moses Abukari, Rudolph Cleveringa, Maria Hartl, and Audrey Nepveu (IFAD); Tanja Winther (Oslo University); and Douglas Barnes and Indira Ekanayake (World Bank).

1. In particular through UN organizations (UNIFEM, FAO, and UNDP) and bilateral agencies—namely, DFID (U.K.), the Netherlands, SIDA (Sweden), USAID (U.S.), and, more recently, GTZ (Germany)—that have included gender as one of the main pillars of their energy assistance programs.

2. Winrock, "Grameen Shakti & Winrock Show the Way: Biogas Offers Fuel, Health and Income Solutions in Bangladesh," Solution Story, South Asia Energy Initiative

Grants Project, Winrock International, Little Rock, AR, www.winrock.org.

3. Joy Clancy, Margaret Skutsch, and Simon Batchelor, "The Gender-Energy-Poverty Nexus: Finding the Energy to Address Gender Concerns in Development," project funded by U.K. Department for International Development, www.sarpn.org.za.

4. Because labor is considered a factor of production, only when women's labor is valued above men's labor do households move from collecting fuelwood to purchasing fuelwood or another fuel commodity, so that the time saved from fuel collection can be invested in other women's income-generating activities.

5. See http://energia-africa.org/GenderAudits.

6. A summary of these tools is provided in ESMAP (2003a).

Thematic Note 3

This Thematic Note was written by Nidhi Tandon (Consultant) and reviewed by Dominique Lallement, Kerry McNamara, and Catherine Ragasa (Consultants); Clare O'Farrell (FAO); Maria Hartl (IFAD); and Indira Ekanayake, Kayoko Chibata Medlin, and Samia Melhem (World Bank).

1. C. K. Pralahad, quoted in *The Economist,* July 9–15, 2005: "Calling an End to Poverty."

2. Andersson et al. 2007.

3. "Sixty to 70 percent of Africa's population live in rural areas and rely heavily on traditional and unprocessed biomass (for example, wood, animal dung, agricultural waste) for their daily domestic energy needs, with limited choice and options of fuels for their productive activities. The rate of access to modern energy in these areas has dropped to as low as 1 percent, in some countries" (UNECA 2005: 9).

4. Simone Cecchini, and Monica Raina, "Village Information Kiosks for the Warana Cooperatives in India," Success/Failure Case Study No. 1 eGovernment for Development, University of Manchester, www.egov4dev.org/warana. htm; National Informatics Centre, "Project Proposal for Wired Village Project at Warana Nagar, Maharashtra," National Informatics Centre, Pune, India, www.mah.nic.in/warana.

5. BBC World Service Trust, "Building Basic Education in Somalia," www.bbc.co.uk.

6. www.comminit.com/en/node/118505;"Building Basic Education in Somalia" (February 22, 2007), www.bbc.co.uk.

7. www.apcob.org.bo.

8. www.healthunlimited.org.

9. www.equalaccess.org; "Equal Access-Making Digital Broadcast Work for Development," www.un.org.

10. "e Lanka Development," www.worldbank.org.

11. www.fao.org/dimitra; "Dimitra Project, Rural Women and Development," www.itu.int/net/home/index.aspx.

12. www.fijifriend.com; www.genderawards.net.

13. www.genderawards.net.

14. www.fao.org/sd/ruralradio; www.simbani.amarc.org.

15. www.hra.am/eng/?page=organization&id=70; www.genderawards.net.

16. Leelangi Wanasundera, "Expanding Women's Capacities through Access to ICT: An Overview from Sri Lanka," paper presented at Gender Perspectives on the Information Society South Asia Pre-WSIS Seminar, Bangalore, India, April 18–19, www.itforchange.net.

Thematic Note 4

This Thematic Note was written by Christine Sijbesma (Consultant) and reviewed by Dominique Lallement and Catherine Ragasa (Consultants); Maria Hartl and Laurent Stravato (IFAD); and Indira Ekanayake (World Bank).

1. See, for example, www.freshschools.org/water&sanitation.htm.

Innovative Activity Profile 1

This Innovative Activity Profile was written by Mari H. Clarke (Consultant) and reviewed by Dominique Lallement (Consultant); Moses Abukari, Rudolph Cleveringa, Maria Hartl, and Audrey Nepveu (IFAD); and Luz Caballero (World Bank).

1. A national household survey in 2001 found that indigenous people represent over 45 percent of the Peruvian population. Nearly 64 percent of these households are poor, and more than 35 percent are extremely poor. A small proportion of the indigenous people live in the Amazon region (World Bank 2006a: 86).

2. The net economic rate of return was 31 percent (World Bank 2007: 26).

3. "Local development window" reflects opening a window of opportunity through which rural communities could translate their expectations into actions and realities (World Bank 2001: 72). This approach builds on indigenous traditions of reciprocity, solidarity, and community work (Dasso 2005: 65; World Bank 2006b: 131).

4. Seventy percent of the illiterate population is Peru consists of monolingual rural indigenous women (World Bank 2006b: 132).

5. Examples of indicators include the number of women involved in the maintenance of rural roads, the number of women attending community meetings related to transport, and the percentage of women attending training workshops on transport and gender (World Bank 2006b: 134–35).

6. Training on gender and road management for project operators (Project Implementation Unit personnel, Rural Roads Institutes, and external consultants) and rural road

operators (microenterprises and members of road committees) in three phases: sensitization on gender, gender in the project cycle, and decentralization and road network management with a gender approach (Gutiérrez 2007).

7. The most common reason given for excluding women from road maintenance was the assumption that the work was too physically demanding. Husbands were also reluctant to authorize their wives' work on the road because men are supposed to be the breadwinners, and both men and women were concerned about what others would think of families whose women worked on the road (World Bank 2007).

8. About 25 percent of the Peruvian population is undocumented because of limited access to name registration, home birthing, and other factors. Most of the undocumented people are rural, indigenous, illiterate, and women (Caballero and Alcahuasi 2007a: 4).

Innovative Activity Profile 2

This Innovative Activity Profile was written by Nidhi Tandon (Consultant) and reviewed by Dominique Lallement and Catherine Ragasa (Consultants); Maria Hartl (IFAD); and Eija Pehu (World Bank). This Profile was largely drawn from UNESCAP (2006).

1. The eBario project has been internationally recognized for its innovativeness and effectiveness and has won several awards, including the Mondialogo Award (2005, Berlin), eAsia Award (2004, Taipei), Anugerah Perdana Teknologi Maklumat (2003, Kuala Lumpur), Industry Innovators Award for Systems Development & Applications from the Society of Satellite Professionals International (March 2002, Washington, DC), Top Seven Intelligent Communities by the World Teleport Association in 2001, and, recently, the Gold Medal of the Commonwealth Association of Public Administration and Management (CAPAM) International Innovations Awards in Sydney, Australia, on October 25, 2006 (see www.researchsea.com).

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MODULE 10

Gender and Natural Resources Management

Overview

In the future, the natural resources needed to sustain the human population will exceed available resources at current consumption levels.[1] Unsustainable and uneven consumption levels have resulted in an increasingly stressed environment, where natural disasters, desertification, and biodiversity loss endanger humans as well as plant and animal species. The challenge of reversing the degradation of natural resources while meeting increasing demands for them involves significant changes in policies, institutions, and practices (FAO 2007a). Effective programming and policies require understanding and addressing the gender-specific relationships to natural resources use and management and highlighting the linkages between natural resources, cultural values, and local knowledge. Addressing the gender-specific aspects of natural resources will provide policy makers with information for more effective natural resource use and conservation policies and will provide guidance for equitable access to natural resources. Here, one must assess the gender-differentiated impacts of environmental changes, including biodiversity loss, climate change, desertification, natural disasters, and energy development.

KEY ISSUES IN NATURAL RESOURCES MANAGEMENT

Natural resources provide a range of goods and services—food, fuel, medicines, fresh water, fisheries, and air and water regulation—that support life on Earth. The rural poor in developing countries remain the most directly dependent on natural resources for their food and livelihood security. Subsistence farmers, fishers, hunters and gatherers, and agricultural wage workers (more than 1.3 billion people) depend on the availability of usable land, water, and plant and animal species for their livelihoods (FAO 2004). Thus, the agricultural livelihoods of poor rural women and men depend on the condition of natural resources, particularly livelihoods of people living on fragile lands (World Bank 2005).

Over the past 50 years, ecosystems have changed more rapidly than in any comparable period of time in human history, largely because of the need to meet rapidly growing demands for food, water, timber, fiber, and fuel (MEA 2005). Now climate change, caused largely by fossil fuel use, further threatens ecosystems. One strategy to mitigate climate change and reduce fossil fuel dependence emphasizes increased use of bioenergy from crops, which is likely to put more pressure on land, water, and species diversity. These changes contribute to the degradation of natural resources, which exacerbates poverty for some groups of people, especially people living in marginal environments (box 10.1). This Module identifies and addresses five major challenges facing sustainable natural resource management and gender:

- Biodiversity conservation and adaptation
- Mitigation of and adaptation to the effects of climate change and variability
- Bioenergy
- Natural disasters
- Land and water degradation and desertification.

Box 10.1 Key Trends in Biodiversity Loss, Climate Change, Bioenergy, Natural Disasters, and Desertification

Current changes in biodiversity are the fastest in human history, with species becoming extinct 100 times as fast as the rate in the fossil record; 12 percent of birds, 23 percent of mammals, and 30 percent of amphibians are threatened with extinction.

- The expected increase in biofuel feedstock production may lead to increased rates of genetic erosion.
- Global fish stocks classed as collapsed have roughly doubled to 30 percent over the last 20 years.
- An increase in so-called dead zones, where marine life can no longer live because of the depletion of oxygen caused by pollutants like fertilizers is expected.
- Annual emissions of CO_2 from fossil fuels have risen by about one-third since 1987.
- Eleven of the warmest years since records have been kept occurred during the last 12 years.
- In the twentieth century the average temperature increased by 0.74°C, sea level increased by 17 centimeters, and a large part of the Northern Hemisphere snow cover vanished.
- There are 20 to 30 percent of plant and animal species that are in danger of extinction if the temperature increases 1.5 to 2.5°C.
- Only very large cuts in greenhouse gases of 60 to 80 percent can stop irreversible change.
- Globally more than 2 million people die prematurely every year because of outdoor and indoor air pollution.
- If present trends continue, 1.8 billion people will live in countries or regions with absolute water scarcity by 2025, and two-thirds of the people in the world could be subject to water stress.
- Unsustainable land use and climate change drive land degradation, including soil erosion, nutrient depletion, water scarcity, salinity, desertification, and the disruption of biological cycles.
- In the first half of 2006, 174 disaster events occurred in 68 countries, affecting 28 million people and damaging property and assets valued at more than $6 billion. Annual economic losses associated with such disasters averaged $75.5 billion in the 1960s, $138.4 billion in the 1970s, $213.9 billion in the 1980s, and $659.9 billion in the 1990s.

Sources: IPCC 2007; MEA 2005; www.unep.org.

Addressing these natural resource challenges requires an understanding of their underlying causes. According to the Millennium Ecosystem Assessment (MEA), the main drivers of change include the following:

- Climate change led by the burning of fossil fuels
- Habitat and land-use change, primarily due to the expansion of agriculture
- Overexploitation of resources, especially overfishing
- Deliberate and accidental introduction of invasive alien species
- Pollution, particularly nutrient loading, leading to a loss of biodiversity, agricultural productivity, and increased human health problems.

Understanding and changing natural resource tenure and governance as well as unequal patterns of access to and control over natural resources lie at the heart of reversing natural resource degradation. These issues are crucial to addressing the gender dimension of natural resources.

In addition, efforts aimed at reversing natural resources degradation must consider other factors, including the following:

- Sociodemographic trends, including growth, migration, and diseases such as HIV and AIDS
- Economic trends, including economic growth, disparities, and trade patterns
- Sociopolitical factors, ranging from equal participation in decision-making processes to conflicts
- Technological change that leads to increases in crop yields and agricultural intensification practices, with severe consequences for natural resources.

Climate change, biodiversity loss, land and water degradation and desertification, and natural disasters share many common causes. Because a worldwide consensus recognizes the acceleration of climate change, efforts to mitigate and adapt to climate change promise to have major consequences for natural resource availability and use. Many of

the solutions and problems of natural resources degradation lie in agriculture. Agriculture, heavily dependent on natural resources, also provides environmental services such as carbon sequestration. Agriculture occupies 40 percent of the land surface, consumes 70 percent of global water resources, and manages biodiversity at the genetic, species, and ecosystem levels (FAO 2007a). Agriculture contributes to soil erosion, agrochemical pollution, and climate change, accounting for about one-third of greenhouse gas emissions (World Bank 2007). Land and water degradation, shrinking biodiversity, and climate change threaten the viability of farming in various settings. Because of gender-differentiated roles and responsibilities in natural resources management, interventions must address the specific needs and opportunities of rural women and men, particularly the poorest, to reduce inequalities, stimulate growth, and reverse environmental degradation.

KEY GENDER ISSUES

Improving natural resource management practices and protecting the environment require reducing poverty and achieving livelihood and food security among rural women and men. The following are some of the key gender issues in natural resources management interventions.

Rural women and men have different roles, responsibilities, and knowledge in managing natural resources

Rural women's and men's different tasks and responsibilities in food production and provision result in different needs, priorities, and concerns. Although rural women's and men's roles and responsibilities vary across regions and cultures, they often follow similar gender divisions of labor. In most regions men use natural resources in agriculture, logging, and fishing for commercial purposes more than women. In crop production in many regions of the developing world, men tend to focus on market-oriented or cash crop production, whereas women often work with subsistence crops, minor crops, and vegetable gardens. Women often grow a wider diversity of crops. In some cases men and women perform complementary roles—for example, men clear land, women plant and tend crops, and men harvest and market crops. However, observers have come to learn that these gender patterns are neither simplistic nor static. For example, women often work with their husbands in producing cash crops. In Kenya women grow green beans for the European market, and in regions where men migrate, women take over household cash crop production. Also, gender divisions of labor vary substantially by age, race, ethnicity, and marital status. Consequently, their water use and management will vary accordingly. For example, men use water for irrigation systems, whereas women may not have access to irrigation systems for vegetable gardens and subsistence crops. In livestock management men often care for cattle and larger animals, and women care for smaller animals such as poultry and small ruminants. In many instances women also have responsibility for collecting fodder for animals, often depending on common property resources that are threatened in many cases.

Because women (and sometimes girls) are often responsible for providing their households with the basic necessities of life—food, fuel, and water—they rely heavily on natural resources. Men seldom have responsibility for collecting and using natural resources for household use. Earlier development efforts assumed that women's fuelwood collection and use led to deforestation, but it is now known that the major problems related to biomass collection include women's and children's exposure to indoor air pollution and heavy workloads for women and girls. Environmental degradation increases women's time for labor-intensive household tasks, such as having to walk longer distances for the collection of fuelwood and water. Decreases in agricultural production and household food security create additional health problems related to their increasing workload. Although both rural women and men play a critical role in natural resources management, women's use, conservation, and knowledge of resources play a key role in shaping local biodiversity. Also degradation of natural resources can alter gender responsibilities and relations in households and communities.

Gender differences exist in rights and access to natural resources, including land, trees, water, and animals

In most societies women typically have fewer ownership rights than men (Rocheleau 1996). Women frequently have de facto or land-use rights as compared to men's de jure or ownership rights. Women often have use rights that are mediated by their relationships with men. Thus, when women are widowed or divorced, they may lose these rights, as in recent cases of land grabbing from AIDS widows in southern Africa. How men and women use resources reflects gendered access. For example, women may collect branches and limbs from trees, whereas men may have rights to harvest trees, but for both men and women, insecure land

tenure reduces incentives to make the improvements in farming practices necessary to cope with environmental degradation. Without secure land rights, women and men farmers have little or no access to credit to make investments in improved natural resource management and conservation practices. Poor rural women lacking secure land tenure often depend on common property resources for fuelwood, fodder, and food and, therefore, for the well-being of their households. The depletion of common property resources poses a severe threat to the livelihoods and food security of poor rural women and men. Women household heads remain at a particular disadvantage in terms of access to land, water, and other natural resources. A key point is that gendered relations and responsibilities in terms of natural resources are dynamic and subject to change.

Access to new technology, information, and training related to natural resource management remains highly gendered, with most of the related initiatives targeted to men

Despite numerous efforts to mainstream gender, many governments, nongovernmental organizations (NGOs), and development agencies find these efforts particularly difficult in the agriculture and natural resource arenas. For example, extension personnel in agriculture and natural resources frequently speak only to men, often erroneously expecting that the men will convey information to their wives. Until gender is successfully mainstreamed, women's groups, organizations, and networks can increase women's access to knowledge, information, and technologies (Agarwal 2003; Enarson and Meyreles 2004; Sachs 2007).

Degradation of the natural resource base can result in new forms of cooperation, conflict, or controversy between men and women or different ethnic groups

When natural resources become insufficient to support the livelihoods of the population, drastic measures result, such as men's or women's out-migration. Men's out-migration leaves women to assume men's traditional roles and responsibilities, increasing their work burden, but leaving them without equal or direct access to financial, social, and technological resources (Lambrou and Laub 2004). In some instances of severe drought, women migrate to secure extra income for their families (Alston 2006). The intrahousehold reallocation of labor can lead to a decline in agricultural production and in turn result in food insecurity and an overall decrease in financial assets (FAO 2005).

Women are still absent from the climate change and natural resource-related decision-making processes at all levels

Equal participation in community-based decision making remains a complex and difficult goal to achieve, especially in the contexts of highly unequal gender and class relations. At the local level, more natural resource projects and interventions emphasize community-level participation. Careful and thoughtful planning in relation to gender must be exercised in the design of participatory projects. Community-level participation often leaves women's voices and concerns unacknowledged. Even when women attend meetings or events, they may not feel free to voice their opinions, or their opinions and needs may not be taken seriously (Agarwal 2003; Prokopy 2004). Community participation often favors local elites, usually men, but sometimes elite women's concerns directly conflict with and override poor women's access to resources such as fuel and water (Singh 2006; Sultana 2006). Despite attempts to mainstream gender at the national and international levels, few women participate. Gender is rarely a central issue in policy initiatives. Men tend to dominate in the newly emerging decision-making and policy arenas of climate change and bioenergy. Women's limited participation in decision-making processes at international and local levels restricts their capacity to engage in political decisions that can impact their specific needs and vulnerabilities (Denton 2002; Masika 2002).

GENDER IN SUSTAINABLE LIVELIHOODS FRAMEWORK

The Module applies a gender in sustainable livelihoods (SL) framework (see the *Sourcebook* Overview for more details on this framework). This framework conceptualizes the following elements as key in the livelihood strategies of the rural poor: assets, markets, information and organizations, risk and vulnerability, and policies and institutions.

The framework adopts a *people-centered approach* that places at the center the agricultural livelihoods of rural women and men and the natural resources management strategies they adopt. The SL framework also requires a *holistic approach* that integrates scientific, technical, and economic aspects with social and human dimensions. This Module applies the SL framework to natural resources management to highlight key gender concerns in programs and projects, and aspects of the framework will be applied in the different Thematic Notes as appropriate. To refrain from repetition, each component of the framework—assets, markets, information and organizations, risk and

vulnerability, and policies and institutions—will not be discussed in detail in each Thematic Note.

Assets

Rural women and men combine a range of assets to achieve their agricultural livelihood outcomes. Assets critical to rural women and men—not only for securing food and a livelihood for their household but also for the conservation and sustainable use and management of natural resources—include the following:

- *Natural resource assets:* land, water, forests, biodiversity
- *Financial assets:* credit, capital, and income
- *Physical assets:* technology, in particular labor-saving technologies
- *Information assets:* local knowledge, formal education, access to information.

A rural household with a large range of assets at its disposal will better cope with shocks and stresses, such as droughts. Poor rural women and men have very limited access to assets. Socially constructed gender roles and relations also influence women's and men's access to assets and the benefits obtained from these assets. Gender-based inequalities often result in women's and girls' limited access to assets, which generates implications for natural resources management conservation. Women face a variety of gender-based constraints as farmers and managers of natural resources. In many societies discriminatory customary and social practices curtail women's rights to land; women generally receive the most marginal lands. Insecure land tenure reduces rural women's and men's incentives to improve natural resources management practices and conservation. Without secure land rights, women and men farmers have little or no access to credit, which is essential for making investments in improved natural resources management and conservation practices. Consequently the technological advances yielding substantial gains in agricultural productivity over the last few decades have often bypassed women farmers and reduced their productivity.

Markets

Access to markets varies by gender and location. Women tend to sell in local markets where they find demand for traditional varieties of crops. Men tend to sell uniform and exotic varieties in export markets. These gender differences in market access vary by location. Local trade can improve rural women's and men's livelihoods by providing them with a source of income and, at the same time, an incentive to manage, use, and conserve a variety of local indigenous plants. However, women, in comparison to men, continue to face many challenges in accessing and benefiting from markets. They face illiteracy, lack of market information, and transport to markets. At the national and global levels, unfair terms of trade still disadvantage poor farmers, including women. For instance, the World Trade Organization's Trade Related Intellectual Property Rights Agreement (see Thematic Note 1) poses direct challenges for poor farmers, particularly women, in accessing seeds for food production. Trade negotiations rarely consider women's and men's different knowledge and skills. They often neglect their use of assets in determining their livelihoods, and they overlook the potentially differential impact of their provisions on poor rural women and men.[2]

Information and organizations

Evidence from different regions shows that women often face more obstacles than men in accessing agricultural services and information as well as in participating in organizations. Men relatives often mediate women's access to information, markets, and credit. Fewer women than men participate in farmers' organizations and commercial networks. Furthermore, agricultural extension services and technology development frequently target men, wrongly assuming men will convey information to women (Lambrou and Laub 2004). Because few women own land in their own names, they rely heavily on common property resources. As women and men use and manage natural resources in different ways, their full and equal participation in community-based decision-making processes remains critical for safeguarding local natural resources.

Risk and vulnerability

Degradation of natural resources disproportionately harms poor rural women and men and sometimes is the principal cause of poverty. In turn, poverty can lead to the overexploitation of natural resources. Rural poor people rely the most directly on natural resources and are the most vulnerable to changes in ecosystems. Significant differences between the roles and rights of women and men in many societies lead to increased vulnerability of women with the deterioration of natural resources. In some instances deterioration of natural resources results in the renegotiation of gender roles. To design ways to mitigate the negative impacts on rural women and men, one must understand the context of their vulnerability.

Vulnerability depends on the types of resources women and men rely on and their entitlement to mobilize these resources. (Those with limited access to resources will have the least capacity to cope with the impacts of natural

resources degradation and are thus the most vulnerable.) Natural resources degradation and natural disasters impact rural peoples' ability to manage and conserve natural resources. These have differential impacts on rural women's and men's livelihood strategies, which also vary according to age, ethnicity, and socioeconomic status.

Policies and institutions

To understand the agricultural livelihood and natural resources management strategies of women and men at the household level, these strategies must be placed within the broader political, socioeconomic, and environmental context. This involves analyzing the current and potential impacts of policies, processes, and institutions on rural women's and men's livelihood strategies and outcomes. The political and institutional context includes the following:

- *Policies:* environmental, economic, energy/bioenergy, and trade agreements
- *Legislation:* such as land rights and intellectual property rights
- *Incentives:* such as for growing cash crops or improved varieties that could replace local varieties or for growing biofuel feedstock
- *Institutions:* extension services that promote technology developments and external innovations
- *Culture:* such as cultural norms and practices that may influence women's and men's access rights and cultural values that may influence gender-based decision making on crop, livestock, and fish selection and management.

Policies and institutional changes in sectors other than natural resources and agriculture include economic and energy development, demographic trends and migration patterns, incidence and impact of disease, and conflicts. Policies, processes, and institutions *have different impacts* on women and men's access to and control over livelihood assets.

BENEFITS FROM GENDER-RESPONSIVE ACTIONS

Benefits from gender-responsive actions can be placed in several overarching categories.
General:

- Overall improvement is seen in natural resources management, use, and conservation and increased agricultural productivity.
- Rural women and men maximize their contributions to household food security.
- Understanding and addressing the gender dimensions of environment and energy programs ensure effective use of development resources.
- Gender relations improve and the social acceptance of women in decision-making positions increases.
- By identifying gender-differentiated opportunities and constraints, project implementers make better-informed decisions and develop more effective environmental and biodiversity conservation interventions.
- Intrahousehold relations improve with an increase in women's control over household resources.
- Women's market participation increases as they become more active and successful in negotiations and trade.

Biodiversity:

- Understanding rural women's and men's roles and traditional knowledge of local biodiversity management, practices, and uses results in the development of innovations that meet farmers' real needs and priorities.
- Development interventions that recognize property rights of rural women and men over their knowledge systems and practices lead to the equal sharing of project benefits as well as increased biodiversity conservation.
- More effective biodiversity conservation interventions result from attention to gender-differentiated opportunities and constraints in agrobiodiversity management.
- Biodiversity conservation increases through recognizing the intellectual property rights of rural women and men.

Climate change:

- Households that are better equipped to cope with the impacts of climate change or extreme weather events can better use, manage, and conserve natural resources.
- Efficient, cost-effective, and relevant interventions take place.
- Gender analysis helps clarify the specific and often different needs, vulnerabilities, and coping strategies of women and men, so that they can be more adequately addressed in response to the impacts of climate change and variability.
- Programs create opportunities to transform gender relations and empower women.

Bioenergy:

- Access to more efficient technologies and modern energy sources reduces the health and safety problems associated

with energy acquisition and use. Such access lifts rural women and men out of poverty and enables women and girls to live more productive and healthy lives.
- The time burden of women and girls of walking long distances, carrying heavy loads, and collecting fuel in dangerous areas is reduced.
- Access to more efficient technologies for household use can reduce health and safety problems associated with indoor air pollution (UN-Energy 2007).
- Women who have access to modern fuels face a lighter cooking burden, which frees up time for educational, social, and economic opportunities.
- Involving both men and women smallholders in bioenergy production offers the possibility of improved incomes and livelihoods.

Natural disasters:

- Gender analysis helps to clarify the specific and often different needs, vulnerabilities, and coping strategies of women and men to better respond to the impacts of disasters.
- Gender-responsive actions better equip households to cope with and recover earlier from the impacts of disasters.
- Postdisaster recovery efforts present opportunities to transform gender relations and empower women.

Land and water degradation and desertification:

- Affected households cope better with the impacts of desertification and more effectively manage and conserve natural resources.
- Promoting the participation of women and men farmers in restoring ecosystem health facilitates the reestablishment of soil and land productivity.
- Strengthening the capacity of rural women and men in dryland management enhances management of local natural resources and protects the environment from further stresses.
- Increasing women's access to information and extension services strengthens their ability to cope with and recover from dryland degradation.

MONITORING AND EVALUATION

Monitoring and evaluation of natural resources management projects provide means for learning from past experience, improving project formulation and implementation, planning and allocating resources, and demonstrating results as part of accountability to key stakeholders (World Bank 2004).[3] By measuring change in the status of women and men over a period of time, gender-sensitive indicators assess progress in achieving gender equality. Researchers have little experience in the area of gender-sensitive indicators in the management of natural resources. To select an indicator, the cost of collecting and analyzing data against the quality and usefulness of the information in decision making must be weighed. The indicator should be relevant to the needs of the users, clearly defined, sex disaggregated, and easy to understand and use (FAO 2007b). Both quantitative and qualitative indicators prove useful (see also Module 16). Examples of gender-sensitive indicators appear in the Thematic Notes in this Module on biodiversity, climate change, bioenergy, natural disasters, and land and water. However, Table 10.1 provides some example indicators across the range of topics.

Depending on the country or region, it may also be relevant to consider ethnicity and caste alongside gender (both as comparative indicators and when collecting data), because women of lower castes or ethnic minorities are usually in the most disadvantaged situation.

Table 10.1 Monitoring and Evaluation Indicators for Gender and Natural Resources Management

Indicator	Sources of verification and tools
Percentage of women and men actively participating in natural resource management committees (including bank account signatory roles)	• Bank records • Committee meeting minutes • Interviews with stakeholders • Local traditional authorities (such as a chief or local council) • Program and project records
Over a set period, an increase of *x* percent in incomes from land-based activities (such as agriculture or forestry) among women-headed households in program areas	• Household surveys • Socioeconomic data from statistics office
Number of women and men in climate change planning institutions, processes, and research (including disaster preparedness and management) at the professional and lay-community levels	• Institutional and university staff records
Average number of hectares of land owned by women- and men-headed households	• Land registration department records
Changes in productive hours spent by, or earnings of women and men, from, household-level agroprocessing, fisheries-, or forest-based enterprises in comparison with baseline (or as percentage of household income)	• Case studies • Sample surveys
Community satisfaction (disaggregated by gender) with changes in natural resources management	• Interviews, before and after • Group interviews or focus groups
Number of women and men receiving training in natural resources management or innovative agroforestry techniques	• Program and project records • Training records
Number of men and women producing bioenergy crops	• Agricultural department statistics • Agricultural extension records • Cooperative records • Household surveys
Percentage of men and women farmers who have access to high-quality, locally adapted planting material	• Agricultural extension records • Interviews with stakeholders
Number of households headed by men, women, or couples benefiting from intellectual property rights	• Natural resources management committee records and meeting minutes
Number of women and men receiving environmental services payments for protecting watersheds or areas of high biodiversity	• Forestry or Natural Resources Management Department records • Global Environmental Facility records • Protected area management committee records and meeting minutes • Protected area management contracts
Percentage of men and women owning and using energy-efficient technologies and low-carbon practices	• Household surveys • Interviews with stakeholders

Source: Authors, with inputs from Pamela White, author of Module 16.

THEMATIC NOTE 1

Gender and Biodiversity

Biodiversity provides the basis for ecosystems and ecosystem services upon which all people depend.[1] Biodiversity in agriculture, forestry, and fisheries underpins agricultural and bioenergy production (FAO 2007a; MEA 2005). Sustainable use and management of biodiversity result in global food security, environmental conservation, and viable livelihoods for the rural poor. For poor rural households, in particular, biodiversity remains a key livelihood asset, because these households are the most reliant on local ecosystems and often live in places most vulnerable to ecosystem degradation. A wide portfolio of genetic resources proves crucial to adapting and developing agricultural production systems and for regulating local ecosystems to meet the food needs of future generations. The challenges of environmental degradation, including desertification and climate change, underscore the need to retain this adaptive capacity. Today the fundamental cause-and-effect relationship between biodiversity degradation and poverty has been recognized. Indeed, biodiversity makes a vital contribution to meeting the UN Millennium Development Goals and will increase in significance in the coming decades (FAO 2007a).

Yet genetic resources are being depleted at unprecedented rates. As mentioned in box 10.1, species extinction is happening 100 times as fast as the rate in the fossil record: 12 percent of birds are threatened with extinction, as are 23 percent of mammals and 30 percent of amphibians (www.unep.org; box 10.2). The main factors contributing to biodiversity loss include unsustainable technologies, destructive land-use practices, invasive species, overexploitation, and pollution (FAO 2005).[2] Climate change, driven by fossil fuel use, changes species ranges and behavior

Box 10.2 Current Trends in Biodiversity Loss

- Biomes with the highest rates of biodiversity loss in the last half of the twentieth century are the following: temperate, tropical, and flooded grasslands and tropical dry forests (more than 14 percent lost between 1950 and 1990).
- Wide-ranging areas have seen particularly rapid change over the last two decades: the Amazon basin and Southeast Asia (deforestation and expansion of croplands); Asia (land degradation in drylands); Bangladesh and parts of the Middle East and Central Asia, and the Great Lakes region of Eastern Africa.
- Based on recorded extinctions of known species over the past 100 years, extinction rates are approximately 100 times greater than those characteristic of the fossil record.
- Genetic diversity has declined globally, particularly among domestic species. A third of the 6,500 breeds of domesticated animals are threatened with extinction because of small population sizes.
- Globally approximately 474 livestock breeds are classified as rare, and about 617 have become extinct.
- Roughly 20 percent of the world's coral reefs have been destroyed, and an additional 20 percent have been degraded.
- Some 35 percent of mangroves have been lost in the last two decades in countries where we have adequate data.

Sources: FAO 2003, 2005; MEA 2005.

(www.unep.org). Unfortunately, one key solution to climate change, the replacement of fossil fuel use with bioenergy, also threatens genetic diversity (see Thematic Note 3). Additional influential forces include agricultural development approaches that favor high-yield and uniform varieties of crops, the heavy use of agrochemicals, and the depreciation and devaluation of diversity and accumulated local knowledge (FAO 2003, 2007a; MEA 2005).

Poor rural households that depend heavily on biodiversity in forests, on common lands, and on their farms use diverse domesticated and wild plants for fuel, food, and building materials. Current policies and economic systems often fail to incorporate the values of biodiversity effectively (www.unep.org). To limit these losses and address the multidimensional problems of biodiversity loss and ecosystem degradation, we need policies and programs that cut across sectors and encompass the technical, economic, and social spheres. The human and social dimension of biodiversity loss requires an understanding of its relation to poverty, as well as the gender-specific relationship to natural resources management.

Box 10.3 Cameroon and Uganda: Indigenous Vegetables

In Cameroon and Uganda, indigenous vegetables play an important role in both income generation and subsistence production. Indigenous vegetables offer a significant opportunity for poor women and men to earn a living, as producers and traders, without requiring a large capital investment. The indigenous vegetable market provides one of the few opportunities for poor unemployed women to secure a livelihood. Despite the growth in exotic vegetables, indigenous vegetables remain popular in rural areas, where people consider them more tasty and nutritious.

Source: FAO 2005.

KEY GENDER ISSUES

Rural women and men play important roles in biodiversity management, use, and conservation through their different tasks and responsibilities in food production and provision. Consequently they have different needs, priorities, and knowledge about diverse crops, plants, and animals. As natural resource managers, they influence the total amount of genetic diversity conserved and used. Women are typically involved in the selection, improvement, and adaptation of local plant varieties, as well as seed exchange, management, and saving. They often keep home gardens where they grow traditional varieties of vegetables, herbs, and spices selected for their nutritious, medicinal, and culinary advantages (box 10.3). Women, therefore, play an important role in maintaining biodiversity, working against the decrease in biodiversity caused in part by men favoring cash-oriented monocultures, as in the Mexican Yucatan (Lope Alzina 2007). Women are also the primary collectors of wild foods that provide important micronutrients in diets, are vital for the survival of their households during food shortages, and may also provide income. In the Kalahari Desert, fruits, gums, berries, and roots gathered by the Kung women provide 60 percent of the daily calorie intake. In the Lao People's Democratic Republic, women gather 141 different types of forest products (Momsen 2007). Women possess extensive, often unrecognized, knowledge of the location stock, and wild plants for achieving household food security and nutritional well-being, especially among the rural poor. However, women's roles and knowledge are often overlooked or underestimated in natural resource management and related policies and programs (Howard 2003).

Local knowledge serves as a critical livelihood asset for poor rural women and men for securing food, shelter, and medicines.[3] The different tasks and responsibilities of rural women and men have enabled them to accumulate different types of local knowledge and skills (FAO 2005). Some studies have expressed concern that local knowledge is disappearing; women do not pass this information on to their daughters, and men no longer pass it down to their sons. Especially in women-headed households (because of HIV and AIDS and migration), changing dietary habits lead to the erosion of women's knowledge of processing, preparation, and storage and lead to the erosion of plant diversity, family food security, and nutritional well-being (Howard 2003).

The type of knowledge farmers possess varies by age, gender, roles and responsibilities, socioeconomic status, and environment. Access to or control over resources as well as education, training, information, and control over the benefits of production also influence the type of knowledge rural women and men have. Experience-based local knowledge interweaves with cultural values and develops and adapts continuously to a gradually changing environment. Rural women's and men's local knowledge, skills, and innovations raise the issue of recognition and protection of farmers' rights.

Markets

Men tend to sell their crops in national or export markets (for uniform, exotic varieties), whereas women tend to sell in local markets where they find demand for traditional varieties (box 10.3). Trade can improve rural women's and men's livelihoods by providing them with income and, at the same time, an incentive to manage, use, and conserve a variety of local indigenous plants. However, women, in contrast to men, face challenges in accessing and benefiting from markets. For example, in the Bamana region of Mali, men have appropriated women's vegetable gardens to establish market-gardening enterprises based on nontraditional foods (box 10.4), which has led to a decline in nutritional well-being.

At the national and global levels, unfair trade disadvantages poor farmers, many of whom are women. New agreements under the World Trade Organization influence biodiversity and have gendered impacts. Gender-based inequalities in access to and control over productive resources have concrete consequences (Randriamaro 2006). Trade negotiations rarely consider women's and men's different knowledge, skills, and uses of agrobiodiversity. The agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) poses direct challenges for poor farmers, particularly women, to access seeds for food production, food security, and nutritional well-being.[4] Moreover, on the one hand, a shift toward production for the global market may be at the expense of local crop varieties for domestic consumption. On the other hand, globalization can give women and men small-producers the opportunity to target niche markets for fair trade or organic products and may go far toward protecting biodiversity (Momsen 2007).

Box 10.4 Mali: Changes in Agricultural Production, Gender Relations, and Biodiversity Loss

A case study of the Bamana region in Mali shows how men dismissed agrobiodiversity and the local knowledge held by women. The introduction of exotic vegetables for market production, mainly a men-driven enterprise, led to a shift from subsistence production of a wide variety of indigenous food plants to market gardening of a limited number of exotic food varieties. This process has led to a change in gender roles, with men taking over women's traditional vegetable gardens to establish commercial enterprises. Although traditionally responsible for growing local plant varieties for direct consumption, women were displaced to marginal lands. This has implications for women's contribution to the food security of their household (reduced income and food production for household consumption) and their social standing in the community. Moreover, women's exclusion from the garden realm may lead to changes in culinary patterns, a possible decline in nutritional status, and a reduction in local plant diversity and overall environmental stability.

Source: Wooten 2003.

Risk and vulnerability

The impact of biodiversity loss, particularly within common property resources, threatens household food security and livelihoods. These resources prove particularly important for poor rural women, who lack secure land tenure and depend on these common resources for fuelwood, fodder, and food and, therefore, the well-being of their households.

Commercialized agriculture often relies on the replacement of a wide range of locally adapted plant and livestock varieties with a relatively small number of uniform, high-yielding varieties, causing the erosion of local plant and animal genetic resources (FAO 1996).[5] With the increased commercialization of agriculture, technological improvements have created farming systems that are highly dependent on external inputs such as agrochemicals, and these systems often bypass women. Because of their limited access to financial resources, women may have difficulty acquiring seeds, technology, and fertilizers as well as information and training. These processes have negative impacts on small farmers, especially women, who rely on a wide variety of genetic diversity as part of their environmental risk management strategy. In turn, this erosion of resources can also lead to the loss of local knowledge and sometimes to changes in gender roles (box 10.4).

Clearly, biodiversity loss entails different consequences for women and men in the performance of their productive, reproductive, and community roles (Lambrou and Laub 2004). Coping strategies such as the improved management of biodiversity should give options for poor rural women and men to reduce their vulnerability to the effects of biodiversity loss and to build the potential to react to further changes (box 10.5).[6] Poor rural women and men farmers often spread risk by growing a wide variety of locally adapted crops, some of which will be resistant to drought or pests, and livestock breeds that have adapted to the local agroecological zone (FAO/IPGRI 1996). Diversification, an important

Box 10.5 HIV and AIDS—Rural Women's and Men's Coping Strategies

Millions of households across Africa have been affected by HIV and AIDS. Rural women and men may respond with a range of coping strategies. For example, in Uganda rural households change the mix of farm products, focusing first on subsistence production and then on growing a surplus to sell in markets (Armstrong 1993). Another strategy is to reduce land under cultivation, resulting in reduced outputs (FAO 2003). In Uganda women-headed households cultivate only 1.3 acre, on average, compared with affected men-headed households, which cultivate 2.5 acres, on average (FAO 2003). Some HIV- and AIDS-affected households have turned to livestock production as an alternative to crop production. Other households sell livestock to pay for medical bills and funeral expenses. A trend has been identified where households raise smaller livestock (such as pigs and poultry) because they are less labor-intensive and often readily available to women.

Source: White and Robinson 2000.

coping strategy adopted by poor rural households, will protect them against climate change, desertification, and other environmental stresses. Women, in comparison to men, are often more vulnerable to the erosion of biodiversity, because they experience gender-based inequalities in accessing assets critical to livelihood security (Lambrou and Laub 2004).

Women and men farmers' full and equal participation in programs and projects dealing with biodiversity conservation, management, and use affects gender-responsive outcomes. Researchers and breeders often work in isolation from women and men farmers and are sometimes unaware of their needs and priorities beyond yield and resistance to pests and diseases.[7] Moreover, extension agents and research organizations tend to consider many local varieties and breeds to be low-performing and inferior. National policies that provide incentives such as loans and direct payments for the use of modern varieties and breeds contribute to the loss of genetic diversity and affect traditional gender roles.

POLICY AND IMPLEMENTATION ISSUES

International policies and agreements regulate the management and use of biodiversity and agrobiodiversity.[8] The majority of these instruments do not highlight the potential gender-differentiated impacts of their provisions. Only the Convention on Biological Diversity (CBD) and the Global Plans of Action (box 10.6) recognize the key roles played by both women and men, especially in the developing world, in the management and use of biodiversity (Lambrou and Laub 2004).[9] Unfamiliar with these policy instruments, extension workers, development agents, and farmers working on biodiversity and environmental conservation will find it challenging to understand their impact and to implement the relevant provisions in their daily work (FAO 2005).

The CBD advocates the fair and equitable sharing of genetic resource benefits. It also establishes a connection between sustainable conservation and development and the rights of indigenous peoples and local communities[10] (FAO 2005; Lambrou and Laub 2004). The International Treaty on Plant Genetic Resources responds to the outstanding issues not covered by the CBD and formally endorses farmers' rights (box 10.7) through a legally binding instrument at the global level. Observers have noted a growing trend toward the recognition and creation of indigenous rights over genetic resources and related knowledge (FAO 2005).

Despite the increased recognition of the linkages between gender dynamics and biodiversity management and use, little progress has been shown in translating these into programs and projects for agrobiodiversity management and conservation at the local level (FAO 2005). Rural women's vital contribution to the management of biodiversity, agricultural production, and household food security remains misunderstood, ignored, or underestimated (Howard 2003).

GOOD PRACTICES AND LESSONS LEARNED

Experience shows that agricultural biodiversity management and related policies and programs have often failed to recognize the differences between rural women's and men's labor, knowledge, needs, and priorities. This negatively affects biodiversity, local knowledge, and household food security.

Community seed fairs in Tanzania

As part of the LinKS project, the Food and Agriculture Organization (FAO) organized community seed fairs in Tanzania to raise awareness about local crop diversity. The FAO provided learning opportunities for the rural communities (including the younger generations), researchers, extension

Box 10.6 Gender and Biodiversity in International Agreements

The Global Environment Facility (GEF), the financial mechanism for the Convention on Biological Diversity, helps countries fulfill their obligations under the CBD. Since 1991 the GEF has invested nearly $7.6 billion in grants and cofinancing for biodiversity conservation in developing countries. The biodiversity portfolio supports initiatives that promote in situ and sustainable biodiversity conservation in protected areas and production landscapes as well as capacity building and knowledge dissemination (www.gefweb.org).

The Global Plan of Action on Plant Genetic Resources, adopted in 1996, provides a coherent framework, identifying priority activities in the field of in situ and ex situ conservation, sustainable utilization, and capacity building (FAO 1996). It develops activities and measures to strengthen women's capacity to sustainably manage these resources (FAO 2005).

The Global Plan of Action for Animal Genetic Resources, adopted in 2007, presents the first internationally agreed-to framework to halt the erosion of livestock diversity and support the sustainable use, development, and conservation of animal genetic resources. The plan supports indigenous and local production systems and associated knowledge systems. In this context, the plan calls for the provision of veterinary and extension services, delivery of microcredit for women in rural areas, appropriate access to natural resources and to the market, the resolution of land tenure issues, the recognition of cultural practices and values, and the addition of value to specialty products (FAO 2007c).

Box 10.7 Farmers' Rights—Protecting the Knowledge of Indigenous People and Local Communities

Farmers' rights are based on the recognition that farmers play a crucial role in the management and conservation of plant and livestock genetic resources. These rights include the following:

- Protection of traditional knowledge relevant to genetic resources for food and agriculture
- Participatory decision making at the national level on matters relating to the conservation and sustainable use of plant genetic resources for food and agriculture
- The right to equitably participate in sharing benefits arising from the use of plant and animal genetic resources.

Source: FAO 2005.

staff, and organizations about the importance of crop diversity and local knowledge in food security. Women were the key collectors and savers of seeds. Seed fairs provided farmers with a meeting place where they could buy, sell, and barter seed, thus encouraging the conservation of crop diversity and the spreading of local seed varieties among women and men farmers. The seed fairs were organized on a local scale to make them accessible and affordable for the rural communities. After exchanging seed varieties, community members discussed local practices. Seed fairs increased local networks, the appreciation of local knowledge, and the roles and responsibilities of farmers in managing agrobiodiversity. (See other examples in Module 12, in particular Thematic Note 2.)

Agroforestry domestication program

A program in Africa supported by the International Fund for Agricultural Development (IFAD) has helped women and men in the domestication, cultivation, and sale of indigenous fruit and medicinal trees. The first phase of the program ran from 1999 to 2003 in Cameroon, the Democratic Republic of Congo, Equatorial Guinea, Gabon, and Nigeria. Training on vegetative propagation techniques enabled many farmers to establish their own nurseries. As a result of project, average household incomes increased, and women and men farmers acquired new skills in propagation techniques, such as grafting and the rooting of cuttings. The program has been particularly effective in improving the livelihoods and status of women. Women's groups have established nurseries, enabling women to participate in income-generating activities. This has led to an increase in school attendance among children. The tree domestication program has also contributed to increased nutritional well-being at the household level, because the women also produce a variety of food for household consumption previously unavailable to them (IFAD n.d.).

Guidelines for policy development on farm animal genetic resources management

A joint FAO, South African Development Community (SADC), and United Nations Development Programme (UNDP) project in the SADC region developed policy guidelines that recognize women's roles in livestock management. Those guidelines assist SADC member states in designing policies and a legal framework for the conservation, sustainable use, and management of farm animal genetic resources. The guidelines stress the need for the effective participation of all stakeholders, with a particular focus on women who own or manage a substantial amount of the genetic resources. In highlighting the vital role that women play, the guidelines call for their full and equal participation at all levels of policy making and implementation. Furthermore, the project encourages the development of policies that provide incentives to farmers for the conservation and sustainable use of indigenous animal genetic resources, as well as for the protection of farmers' rights and indigenous knowledge.

The Philippines: indigenous knowledge systems and intellectual property rights

Funded by IFAD and implemented by the International Research Centre for Agroforestry between 2003 and 2004, this project aimed to provide technical assistance in documenting the ethnobotanical knowledge of the Subanen indigenous communities, especially that of women. The objectives included identifying and documenting traditional rice varieties and wild plants and animals, facilitating local participatory planning of natural resource management, and establishing property rights of local communities over their knowledge systems and practices. Men and women participated equally in learning new skills of technical documentation. The technical expertise of the Subanen members of the ethnobotanical documentation team, as well as of concerned women, was enhanced significantly. Technical assistance helped the communities ensure that documentation material that was produced guaranteed their intellectual property rights. A memorandum of understanding signed by the government on behalf of the communities and based on their specific requests and stipulations secured their intellectual property rights and options for obtaining benefits from any future commercial or beneficial use of their knowledge. The project also awakened a strong interest in local women in continuing the reproduction of threatened rice varieties for in situ conservation and documentation (IFAD 2004).

Nepal and India: gender, genetic resources, and indigenous minorities

The International Development Research Centre (IDRC) carried out an action research project on agrobiodiversity management among three ethnic groups in the eastern Himalayas, with a special focus on gender. The three groups were the Rai of east Nepal, the Lepchas of Sikkim and Kalimpong, and the Chekasang and Angami of Nagaland, India. All three research teams received training workshops in gender analysis and writing skills. In Nepal the team built on six years of community development experience in participatory plant breeding to undertake an action research project to develop seed technologies for maize. The IDRC provided interested farmers with rudimentary plant-breeding skills (field isolation, plant selection, cob selection, storage practices). The organization provided timely technical action for maintaining seed purity in the course of the crop cycle and was successful in generating new seeds for the coming season. The organization also initiated similar activities with 50 farmers in an adjacent community. After a visit to eastern Nepal, two agricultural scientists from neighboring Sikkim and Kalimpong started a similar initiative with 20 farmers in Kalimpong, focusing mainly on the development of a disease management strategy for ginger, based on best practices from farmers.

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

Rural women's and men's vulnerability to biodiversity loss must be understood, so planners can design ways to mitigate the effects of decreasing biodiversity. This implies an understanding of the following issues:

- Rural women's and men's different local knowledge of indigenous plant, fish, and livestock biodiversity uses and practices, including their cultural values and belief systems that influence their traditional knowledge and biodiversity management practices
- The livelihood constraints and opportunities of rural women and men who are managers and users of biodiversity and, in particular, the gender-based inequalities in accessing and controlling critical livelihood assets such as land, credit, technology, and information, as well as participation in farmers' organizations and other decision-making processes
- The different ways rural women and men use biodiversity management practices to secure a livelihood in the

face of environmental stresses such as floods and droughts and other shocks such as HIV and AIDS
- Strategies to improve farmers' involvement and benefit sharing, in particular, the issues of farmers' rights and obtaining prior informed consent, which should be considered within a legal and ethical context[11]
- Eliminating incentives for uniform varieties and supporting rural women and men in accessing information about their rights to plant genetic resources (FAO 2005)
- Gender-sensitive participatory plant breeding, which contributes to the conservation and sustainable use of plant and animal genetic resources;[12] as women and men use and manage agrobiodiversity in different ways, their full and equal participation in decision-making processes is critical for safeguarding local biodiversity.

Often the most appropriate solutions to local problems and needs combine traditional and scientific methods. This fusion enhances the adoption and acceptance of the new methods by the local community and provides methods that reflect the actual needs of women and men.

MONITORING AND EVALUATION

The following are examples of gender-sensitive indicators for biodiversity (FAO 2007b):

- Percentage of men and women farmers who have access to high-quality, locally adapted planting material
- Number of households headed by men, women, or couples benefiting from intellectual property rights
- Ratio of men's and women's income from production of high-value horticultural crops
- Ratio of the number of livestock owned by men and women
- Amount of credit and microcredit available to women and men for improving livestock enterprises.

THEMATIC NOTE 2

Gender Dimensions of Climate Change

Global climate change is one of the greatest environmental challenges facing the world today. In the twentieth century the increase in global average temperature reached 0.74°C, the average sea level increased by 17 centimeters, and the Northern Hemisphere experienced a considerable decrease in snow cover (IPCC 2007). Eleven of the warmest years since records have been kept have occurred during the last 12 years, representing an accelerating warming trend. The Intergovernmental Panel on Climate Change (IPCC)[1] projects additional global warming over the twenty-first century from 1.8 to 4.0°C.[2] According to the IPCC's Fourth Assessment Report, climate warming is unequivocal, evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising sea levels. Long-term changes in climate include widespread changes in precipitation, ocean salinity, wind patterns, and extreme weather events. Extreme weather events resulting from climate change include droughts, heavy precipitation, heat waves, and the intensity of tropical cyclones (IPCC 2007).

The increase in greenhouse gas[3] concentrations accounts for most of the observed increase in global average temperatures since the mid-twentieth century.[4] The international response to climate change focuses on mitigation measures that aim to reduce greenhouse gases and enhance carbon sinks. Carbon sinks are the natural ability of trees, other plants, and the soil to soak up carbon dioxide and temporarily store the carbon in wood, roots, leaves, and the soil. However, in recent years many observers recognize adaptation strategies as critical elements in reducing the vulnerabilities to climate-induced change to protect and enhance the livelihoods of poor women and men (Soussain, Burton, and Hammil 2003). Even if we stabilize greenhouse gas concentrations, climate change will continue for centuries, and the ability of the most vulnerable to adapt will remain a serious issue (IPCC 2007).

Climate change poses a serious risk to poverty reduction and development, with adverse impacts expected on the environment, human health, food security, economic activity, natural resources, and infrastructure.[5] Global warming will have profound effects on agriculture, forestry, grasslands, livestock, and fisheries and, thus, on food security (FAO 2007). The IPCC assesses that 20 to 30 percent of plant and animal species are in danger of extinction if the rise in global average temperature exceeds 1.5 to 2.5°C. The sharpest impact of a changing climate will be the rise in incidence and severity of climate-related disasters such as increased flooding, particularly in Asia, as well as fiercer storms and prolonged droughts (see Thematic Note 4). The IPCC's Fourth Assessment Report warned that global warming would cause widespread food shortages in the developing world (Harvey 2007; IPCC 2007).[6]

Although industrial countries' use of fossil fuel and industrial processes contributes inordinately to greenhouse gas concentrations, people living in developing countries are most likely to suffer the consequences of climate change (box 10.8). This uneven distribution of the impacts of climate change occurs both between and within countries. Least-developed countries prove the most reliant on rain-fed agriculture and natural resources and are the most vulnerable to climate change. These countries generally lack the necessary adaptive capacities, such as a stable economy, infrastructure, technology, information dissemination system, and equitable access to resources. Poor people tend to live on marginal lands that are most subject to droughts or floods and are most likely to be affected by small changes in climate variability. Because of gender-based inequalities in accessing critical livelihood assets such as land, credit, technology, information, markets, and organizations, women have more exposure to these risks.[7]

Box 10.8 Examples of Projected Negative Impacts of Climate Change

- A rise in sea level exposes many communities to severe flooding from storm surges.
- A decline in water availability may leave billions of people facing water shortages, especially in the Middle East and Indian subcontinent.
- In the tropics and subtropics, even small temperature increases can impact crop production.
- Desertification (in particular in parts of Africa, Asia, and the Middle East) and depletion of forests (in particular in the tropics and subtropics) lead to a loss of biodiversity.
- Disruptive seasonal rainfall patterns lead to droughts and floods, impacting crop production and increasing food insecurity in many parts of the developing world.
- Increased frequency and intensity of extreme weather events combined with constraints on mobility lead to loss of life, injury, population displacement, and economic devastation in the least-developed countries.

Sources: IPCC 2001, 2007; Martens 1998; Masika 2002.

KEY GENDER ISSUES

Until recently, international climate change policy makers have neglected the gender dimension of climate change (Lambrou and Piana 2006a). A focus on technical solutions has ignored social and political factors (Masika 2002). The successful implementation of climate change policies and projects requires an understanding of the gender-based roles and relationships vis-à-vis natural resources, as well as the gender-differentiated impacts of climate change and the different risks and vulnerabilities of women and men. This includes the structural constraints that curtail women's access, control, and ownership over assets (Denton 2002). Research must also identify who is responsible for CO_2 emissions and how social, political, and planning conditions might affect emission reduction (Lambrou and Piana 2006b). A discussion of some gender issues related to climate change follows.

Climate change impacts

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 fuelwood for heating and cooking. The time needed for their work in gathering water and fuel will likely increase with water shortages and 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 (see also Module 1).

Another example of climate change that directly impacts men and women differently is the effect of climate change on water quality and supply. Children and pregnant women are physically vulnerable to waterborne diseases, and their role in supplying household water and performing domestic chores makes them more vulnerable to diseases, such as diarrhea and cholera, that thrive in conditions of degraded water.[8] Decreased water resources may also cause women's health to suffer as a result of the increased work burden and reduced nutritional status. For instance, in Peru following the 1997–98 El Niño events, malnutrition among women was a major cause of peripartum illness.

Adaptation

At the local level, farmers continuously adapt to climate variability. They change crops or varieties, choose different harvest and sowing dates, alter land management, and employ water efficiency techniques (FAO 2007). Long-term climate change poses a new set of challenges to farmers dependent on natural resources, and so at the national and international levels, governments and development agencies play a fundamental role in building the capacity of farmers to cope with and adapt to a changing environment (Soussain, Burton, and Hammil 2003).

The adaptive capacity of people depends on how they can draw from resources to maximize their livelihood outcomes (Masika 2002), so adaptation depends on factors such as economic status, technology, health, education, information, skills, infrastructure, access to assets, and management capabilities (IPCC 2001). 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, women have distinct vulnerability, exposure to risk, coping capacity, and ability to recover from climate change impacts (Masika 2002). Although women are generally more vulnerable to the impacts of climate change, they play an active role in adapting to its impacts to secure food and a livelihood for their household.[9]

Gender components determine adaptation strategies in terms of how men and women can contribute. For example, as a result of gender-differentiated roles in agrobiodiversity management, women often have greater knowledge of indigenous plant varieties with important nutritional and medicinal values (FAO 2005). 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 resources management, use, and contributions necessary for adaptation.[10]

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 (Kurukulasuriya and Rosenthal 2003).

Finally, a gender component exists for the adaptive strategies that are pursued and the consequences of adaptation. For example, in New South Wales, Australia, women migrate away from farms for work, which enables men to remain in agriculture. In other regions impacted by drought, men migrate, leaving women, who have fewer resources, to perform agriculture. In either case, the drought strains traditional gendered relationships (Alston 2006).

Mitigation

Mitigation has revolved around the reduction of greenhouse gases and the enhancement of carbon sinks to absorb them (Boyd 2002).[11] Although responsibility for carbon emissions resides primarily in industrial countries, fossil fuel use and industrial processes, rural poverty, and subsistence agriculture account for a portion of emissions of carbon dioxide that stem from deforestation and land-use change.[12] In addition, rural poor women and men generally lack access to energy-efficient services that do not degrade the ecosystem or contribute to environmental change. Rural households typically rely on biomass for cooking and heating. Because women usually prepare food, their decisions about cooking fuels and efficiency can reduce carbon emissions. Households with lower average income and level of education generate lower emissions; however, they also have a lower mitigation and adaptive capacity. Low educational levels of women and men household members limit awareness of mitigation options, such as the use of energy-efficient devices (Lambrou and Piana 2006a). Therefore, as issues of sustainable energy development (renewable energy and energy efficiency) and sustainable transportation receive more attention, it is important to encourage and improve the active involvement of key stakeholders. Women's active involvement in agriculture, and their dependence on biomass energy, make them key stakeholders in effective environmental management related to mitigation (Denton 2002).

GOOD PRACTICES AND LESSONS LEARNED

Programs in Bolivia, Costa Rica, and India contribute to good practices and lessons learned.

Bolivia: Noel Kempff Climate Action Project

Unfortunately, many climate change projects fail to take gender into account. For example, in 1996, in the region of Santa Cruz in the Bolivian Amazon, the Noel Kempff Climate Action Project's primary objective involved purchasing logging concessions and expanding the Noel Kempff National Park to 1.5 million hectares for conservation and increased carbon credits. However, the project failed to take into account a gender perspective that recognized the different power relations and cultural practices as well as the gender bias in institutions (Boyd 2002). The project also aimed to improve local agricultural and forest management practices, stimulate employment, and obtain 400,000 hectares of communal land for three key local communities. The project provided opportunities for the participation of both women and men, who successfully participated in some aspects of the project. The participants met some basic necessities, such as trying new varieties of crops and accessing credit. With a majority of men local and technical staff, women had little chance to join decision-making processes relating to the future of the park, land title, and other project activities. Men dominated public meetings, overlooking women's needs and concerns, which ultimately were not reflected in the project activities. Boyd (2002) stresses that the project did not challenge existing gender relations and division of labor, nor did it empower women. The project's enforcement of existing social structures and wide reliance on traditional norms in decision making weakened women's ability to participate.

Costa Rica: Carbon emission mitigation through Payment for Environmental Services Programme

Since 1996 Costa Rica's government has implemented the Payment for Environmental Services Programme (Programa

de Pago por Servicios Ambientales) to promote and encourage conservation, reforestation, carbon emission mitigation, and sustainable management of Costa Rica's natural resources.[13] The program offers economic rewards to landowners who conserve the forests on their land. However, most landowners are men, and women have little access to the economic rewards. To help resolve this problem, FONAFIFO (National Fund for Forestry Finance), the national institution in charge of implementing the program and promoting gender equity, imposes a fee. This fee goes into a fund to support women who want to become landowners.[14]

India: carbon sequestration project

An innovative agroforestry project in Gudibanda Taluk, Karnataka, India (implemented by the NGO Women For Sustainable Development [WSD]), supports local women and men farmers in planting mango, tamarind, and jackfruit tree orchards for harvest and carbon sequestration.[15] The project supports women's participation in decision-making processes. One way in which the project does this is by taking into account women's time and cultural constraints when establishing public forums. The project set up a prototype carbon marketing facility to sell the certified emissions reduction of the global environmental services that the participants (poor rural women and men) provide.[16] Because farmers have an average annual income of less than $100, they cannot afford to plant fruit trees without financial assistance. Success requires expensive irrigation changes and planting tools. Farmers will live on the carbon sales from their mango plantations for the first few years, until they harvest their crop. Fruit production should start about four years after planting, and one acre of crop will at least triple their annual income. The program anticipates sustainable incomes for women and men farmers, as well as the additional benefits derived from the ecofriendly farming techniques. The project lifetime is 35 years, with an estimated CO_2 benefit of 23 tons of carbon sequestration per acre. The project target is 35,000 acres, for a total sequestration of 575,000 tons of carbon.

POLICY AND IMPLEMENTATION ISSUES

The United Nations Framework Convention on Climate Change (UNFCCC), the main international policy instrument to address climate change, aims to stabilize the concentrations of greenhouse gases in the atmosphere within a time frame sufficient to allow ecosystems to adapt naturally to climate change. The UNFCCC, supported by the 1997 Kyoto Protocol, contains legally binding targets that dictate that industrialized countries must reduce by 2008–12 combined emissions of six key greenhouse gases by at least 5 percent in relation to 1990 levels.[17] The Global Environment Facility and the Clean Development Mechanism (box 10.9) of the Kyoto Protocol play a role in climate change mitigation and adaptation strategies.[18]

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

Awareness and understanding of the complex links between gender roles and relations, the environment, and livelihood security will aid in the design of climate change mitigation and adaptation projects. To ensure women's participation in climate change mitigation and adaptation projects, we must incorporate women's needs and concerns in the design of relevant and successful climate change policies. Pinpointing specific goals within the main climate policies and developing corresponding indicators for monitoring and evaluation will help mainstream gender issues into climate change policies. Ways of incorporating women's needs and concerns relating to mitigation include the following:

- Analyze women's and men's energy use, transport use, and other consumption patterns impacting climate.
- Introduce more formal and informal education about the environmental impacts of their current life styles to increase men's and women's mitigation capacity (Lambrou and Piana 2006b).
- Promote cleaner-burning fuel for household use to reduce harmful emissions, cut household energy costs, and reduce women's and girls' work burdens.
- Increase poor women's and men's access to payments for environmental services.

Goals and issues related to adaptation include the following:

- Many women prove to be proactive at local levels in mitigating hazards and strengthening the disaster resilience of households and communities.
- Make available to both men and women usable, science-based climate prediction information and incorporate existing local knowledge (FAO 2007).
- Strengthen the capacity of rural institutions such as extension services to use appropriate tools and strategies, including participatory identification of current vulnerabilities and risk reduction measures, implementation of prioritized community-based disaster risk reduction

Box 10.9 The Potential of the Clean Development Mechanism

In the Kyoto Protocol the Clean Development Mechanism allows for and addresses divergent objectives and priorities between the North and South. A bilateral agreement between an industrialized country and a developing country mandates reduced greenhouse gas emissions under the convention. Under the CDM industrialized countries invest in projects that increase economic productivity and may reduce local environmental problems in developing countries (Denton 2002).

Those projects that focus on technologies relating to household energy, food processing, forest management, and water pumping must target both rural women and men and take into account their different roles and responsibilities. However, extension services that convey this technology typically target men, who are perceived as the principal decision makers and users of these technologies (for a more detailed discussion, see Denton 2002; Wamukonya and Skutsch 2001).

activities, and increased capacity of communities to manage their resources (FAO 2007).

MONITORING AND EVALUATION

Examples of gender-sensitive indicators in climate change include (indicators are from Aguilar 2007; FAO 2007) the following:

- Proportion of men and women who own and use non-motorized transport and use public transport
- Number of women owning and using energy-efficient technologies, using renewable energy, and involved in sustainable forest management (climate change mitigation)
- Number of women and women-headed households receiving training and assistance related to disasters (such as the number of women who know how to swim)
- Participation of women in climate change–planning institutions, processes, and research (including disaster preparedness and management) at the professional and lay-community levels.

THEMATIC NOTE 3

Gender and Bioenergy

Over one-third of the world's population, 2.4 billion people, rely on traditional biomass in the form of fuelwood, agricultural residues, and animal wastes for their primary energy needs (Sagar and Kartha 2007). Use of traditional biomass poses many problems: poor health, heavy workloads, land degradation, deforestation, biodiversity loss, and climate change. New forms of bioenergy, primarily liquid biofuels, are rapidly being developed as replacements for fossil fuels. Global interest in modern bioenergy—which includes liquid biofuels, biogas, and solid biomass—has grown rapidly in recent years.[1] (This Thematic Note focuses on modern bioenergy; for a detailed discussion on the wider issues of gender and energy, refer to Modules 9 and 15.)

At a time when energy analysts anticipate a period of unpredictable oil markets, fossil fuel dependence poses a major risk for many developing economies. Oil imports now consume a large and unsustainable share of the meager foreign exchange earnings of many poor nations, offsetting any gains from recent foreign debt elimination agreements. Unstable and unpredictable oil prices have complicated economic planning around the world and are further damaging poor economies (UN-Energy 2007).

Available energy services currently fail to meet the needs of the world's poor. Four out of five people without electricity live in the rural areas of developing countries (UNDP 2004; UN-Energy 2007). Extending an electricity supply grid to remote households in rural areas is unlikely to occur quickly because of costs that are seven times the cost of providing electricity in an urban area (FAO 2006).

Given plausible economic and institutional assumptions, this century could see a significant switch from fossil fuels to bioenergy, with agriculture and forestry as the leading sources of biomass for biofuels (FAO 2005).[2] Although increased production of, and access to, bioenergy offers only one of the possible answers to climate change and energy security challenges,[3] a number of features make it an interesting but complicated option (FAO 2007). Locally produced bioenergy can supply energy for local agricultural, industrial, and household uses, in some instances at a lower cost than fossil fuels (UN-Energy 2007). Modern bioenergy, with appropriate policies, could help meet the needs of poor women and men who lack access to electricity, while generating income and creating jobs in poorer areas of the world.

Although the rapid development of modern bioenergy presents a broad range of opportunities for achieving sustainable energy, it also entails multiple trade-offs and risks. The first concern relates to the impact of bioenergy on food markets, food prices, and food security. Current biofuels depend on food crops, including corn, sugarcane, soybeans, rapeseed, and palm oil. The boom in bioenergy has already resulted in some rises in food prices.[4]

A second concern is the impact of modern bioenergy production on sustainable livelihoods for rural households. If production and processing of biofuels occur through large-scale, vertically integrated commodity chains, small farmers will be unlikely to benefit. Efforts to use biofuels to promote sustainable development must include strategies to incorporate small producers (Sagar and Kartha 2007).

The rapid development of modern bioenergy requires careful handling of key social, economic, and environmental sustainability (UN-Energy 2007). New crops, farming techniques, and second-generation technologies (for example, fuels made from lignocellulosic biomass feedstock using advanced technical processes) now under development may mitigate some of the social, environmental, and economic costs associated with large-scale production of liquid biofuels and increase their potential and environmental benefits.[5] Where we grow crops for energy purposes, use of large-scale monocropping could lead to significant biodiversity loss, soil erosion, and nutrient leaching, with negative consequences

for local rural women's and men's ability to secure food and their livelihoods.

Most likely, new bioenergy production will involve large-scale biomass production that does not necessarily benefit the rural poor. The challenge is to develop small-scale bioenergy concepts and technologies that local people can use and sustain. A transitional solution uses improved cook stoves, which reduce indoor pollution and burn fuel much more efficiently. Bioenergy options, such as small- and medium-scale biogas or gasifiers and power generators, operate with locally available biomass resources. They may become the most economical and reliable providers of energy services for poor rural women and men (UN-Energy 2007).

KEY GENDER ISSUES

Gender-differentiated issues related to bioenergy differ substantially among traditional biomass, small-scale biofuel production, and large-scale biofuel production.

Gender and traditional bioenergy

Rural women shoulder the burden of traditional biomass (fuelwood, manure, agricultural residues) collection. Many women spend up to three to four hours a day collecting fuel for household use, sometimes traveling 5 to 10 kilometers a day (WHO 2006). Women in women-headed households report water and fuelwood collection as their most time-consuming tasks (FAO/IFAD 2003). In many African, Asian, and Latin American countries, rural women carry approximately 20 kilograms of fuelwood every day (FAO 2006). Increasing pressure on and degradation of these resources result in women walking longer distances from the safety of their communities. This increases their work burden, limiting time available for food production and preparation, household-related duties, and their participation in income-generating activities and educational opportunities.

Women's limited access to fuelwood relates to the heavily gendered nature of rights and responsibilities with respect to trees. Mearns (1995) reports that in Kenya women are expected to provide their households with daily supplies of wood, but they lack access to tree farms. Men dominate tree planting, and trees planted in woodlots typically fall under men's control. Rights to trees are tied to land ownership, which falls almost exclusively to men. Thus, although trees may be nearby, women may lack access to them and therefore walk long distances to gather wood or switch to other types of biomass for fuel, such as maize stalks or dung.

Reliance on traditional biomass further entrenches gender disparities. When women spend many hours collecting traditional fuels, they do not receive education and training for productive income-generating activities. When withdrawn from school to gather fuel and attend to other domestic chores, girls lose literacy opportunities and suffer lifelong harm. They also have less time to participate in organizations and learn to negotiate in decision-making processes. Household use of traditional bioenergy locks people in the developing world, women in particular, into a cycle of poverty and ill health (UN-Energy 2007).

The most dramatic gender-differentiated and health benefits from the use of modern bioenergy relate to household applications. Traditional bioenergy uses affect the health of women more severely than men, because women traditionally bear responsibility for household-related duties, including food preparation (UN-Energy 2007). Rural people rely heavily on biomass as their primary cooking fuel: 93 percent in sub-Saharan Africa, 87 percent in India, and 93 percent in Indonesia (Sagar and Kartha 2007). Open fires in the household produce unventilated smoke and expose women and children, who are most often indoors, to high concentrations of carbon monoxide, nitrogen oxides, and other pollutants (Lambrou and Piana 2006). Smoke inhalation from cooking indoors with traditional biomass increases the risk of major diseases and is the sixth largest health risk in developing countries. The rural poor in Southeast Asia and sub-Saharan Africa suffer the highest death toll (Schirnding and others 2000; UN-Energy 2007).

Many early efforts to reduce use of traditional biomass involved the development and introduction of improved cook stoves. These efforts had limited success. Some of the improved stoves were less efficient than claimed and were relatively expensive. Women were reluctant to give up traditional cook stoves because they preferred cooking with them, and the stoves offered additional benefits of heating and repelling insects. More recent cook stoves have achieved more success, especially in China and India, with estimates of 220 million improved cook stoves worldwide (Sagar and Kartha 2007).

Gender and modern biofuels

Shifting basic energy uses from traditional bioenergy (when used in unsustainable and health-damaging forms) to modern fuels and electricity poses difficult challenges (UN-Energy 2007). When household income increases, people typically switch to more fuel-efficient technologies. The push to modern bioenergy offers both possibilities and

challenges for enhancing gender equity. Poor rural women and men often lack the economic resources to use different bioenergy options.[6] The rural poor, a disproportionate number of whom are women, do not have the means to purchase modern energy services. The cost and efficiency of a stove or other systems such as biogas or small gasifiers often deter women more than the actual cost of fuel (UN-Energy 2007).

Modern bioenergy may take the form of small-scale production or large-scale plantation production. Small-scale biofuel use has the potential to reduce women's health risks from wood fires and reduce their work collecting fuelwood. Biofuels have the potential to reduce women's work burden, but they may also generate additional work if women produce the biomass to make the fuel (such as for biogas) (UN-Energy 2007).

The transition to liquid biofuels may especially harm women and men farmers who do not own their land and the rural and urban poor who are net buyers of food. "At their best," according to UN-Energy (2007: 24), "liquid biofuel programs can enrich farmers by helping to add value to their products. But at their worst, biofuel programs can result in concentration of ownership that could drive the world's poorest farmers off their land and into deeper poverty." The rural poor, women in particular, typically do not have official title to their land. Driving small farmers without clear land titles from their land will destroy their livelihoods (UN-Energy 2007).

Large-scale bioenergy production

Several key gender issues that may result from the production of large-scale biofuels include the following:

- Biofuels require the intensive use of resources including land, water, chemical fertilizers, and pesticides, to which small farmers have limited access. Women, and particularly women in women-headed households, will face greater barriers acquiring these resources and participating in biofuel production (Rossi and Lambrou 2008).
- The large amount of land required for biofuel production will put pressure on marginal land and common property resources. Marginal lands are particularly important for women who raise food crops, collect fodder and fuel, and graze livestock. The conversion of these lands to biofuel crops might result in the displacement of women's agricultural activities toward lands that are even more marginal, thus decreasing household food security (Rossi and Lambrou 2008).
- The potential loss of biodiversity from large-scale monoculture plantations may affect women and men differently. The establishment of plantations on previously uncultivated land may threaten wild edible plant species. Women often rely on the collection and preparation of wild plant species for food, fodder, and medicine.
- Livestock farmers will be particularly affected by biofuel production with the conversion of grazing land to crop land and the higher price of livestock feed. Livestock is especially important for the food security of poor farmers. The potential reduction in the number of animals, especially ruminants (cattle, sheep, and goats), raised by small farmers, will reduce their livelihood strategies. In many regions men are primarily responsible for managing cattle and buffalo, and their ability to raise these animals will be affected (Rossi and Lambrou 2008).

POLICY AND IMPLEMENTATION ISSUES

The Earth Summit in Rio de Janeiro in 1992 and the Fourth World Conference on Women in Beijing in 1995 recognized the need to design environmental and energy programs with a gender focus (Salazar 1999). In 2001 the Ninth Session of the Commission on Sustainable Development urged governments to address the health and safety concerns of women and children in rural areas related to the impacts of carrying loads of fuelwood over long distances and exposure to smoke from indoor open fires. In addition, the commission recommended international cooperation to promote equal access to energy through energy policy decision-making processes (Lambrou and Piana 2006).

In 2006 FAO launched the International Bioenergy Platform as a framework for bioenergy cooperation. This program aims to enhance access to energy services from sustainable bioenergy systems, emphasizing the provision of modern, gender-sensitive bioenergy services for local communities and the most vulnerable and poor.

In many developing countries, small-scale bioenergy projects could face challenges obtaining financing from traditional financing institutions. Although these projects could provide modern energy services to rural women and men currently lacking access, they will likely require credit mechanisms at all stages of production.

GOOD PRACTICES AND LESSONS LEARNED

Some observers have suggested that the rural poor, who have a small environmental footprint, gained positive experiences with the decentralized and small-scale production

and use of fuel crops. The production and use of liquid biofuels from local feedstock improve access to sustainable and affordable energy for poor rural women and men (DESA 2007).

Zambia: Small-scale production of liquid biofuels

For the last seven years a group of Zambian women with the support from German Technical Cooperation (GTZ) have developed a soap-making enterprise using jatropha oil. Between 2000 and 2001 the National Oilseeds Development Program, under the Ministry of Agriculture and Cooperatives of Zambia, carried out demonstrations on the various uses of jatropha oil through national agricultural and commercial shows. This project used a bottom-up approach, promoting women's participation and ownership. In 2006 the Biofuels Association of Zambia mounted an awareness campaign on the potential of *Jatropha curcas* to provide practical substitutes for fossil fuels and its important implications for meeting the demand for rural energy services. In its 2007 budget the Zambian government allocated $150,000 for research on *J. curcas* and other biofuels. Biofuels predominate in new energy policies, which often set standards for a specified minimum proportion of biofuels in blends for all consumers. In this project rural women and men are improving their livelihoods and generating income through activities related to the production of jatropha oil.

Tanzania and Mali: Small-scale biofuel production

In Tanzania a project has sought to introduce and expand production of jatropha as a cash crop for raw material for plant-oil industries. They demonstrated its potential in reforestation, erosion control, and reclamation of degraded land. Working with local women's groups, the grantee (KAKUTE Ltd.) trained over 1,500 women and men in jatropha management techniques and planted more than 400 hectares of jatropha on marginal lands donated by the communities. The project successfully demonstrated the livelihood benefits of the crop, helping launch jatropha farming as a cash crop, while assisting others to begin soap-making businesses. Seventeen different village-based women's groups coordinated the project. Women produced the seedlings and cuttings for planting. In the first four years of the pilot project, they sold 52,000 kilograms of seeds to oil processors for approximately $7,800, producing 5,125 liters of oil, worth about $10,250 on the local market, and 3.5 tons of soap, worth $20,533. Although the amount of oil and soap produced does not approximate the capacity of the land to produce jatropha seeds, it goes a long way toward demonstrating the potential profitability of the crop. The project aimed to improve rural women's and men's livelihoods and income-generating activities using bottom-up approaches and promoting women's participation and ownership.

The Mali Folke Center in Mali works with local rural women and men in developing plantations of jatropha.[7] Working with the GTZ, they use a UNDP-led technology, a multifunctional apparatus called the Mali platform, which can run on crude jatropha oil. The platform generates electricity for the whole community and powers water pumps, crushes the oil seeds, and provides energy for a welding and carpentry shop. The Mali Folke Center converted its Toyota pickup truck to run on jatropha oil. Women, the main beneficiaries of the project, have cited the ability to use jatropha oil for soap making as more of an economic benefit than the energy.

Nepal: Biogas program

The World Bank's biogas project in Nepal aims to develop biogas use as a commercially viable, market-oriented industry by bringing fuel for cooking and lighting to rural households. Subsidies provide a key element in making these biogas plants accessible to poor households. Between 2004 and 2009 the project will install 162,000 quality-controlled, small-size biogas plants in the Terai, hill, and mountain regions of Nepal. Revenue from the Community Development Carbon Fund will reduce the dependency on large government and external donor subsidies and will help expand the biogas installation to more remote and poorer areas. These biogas plants displace traditional fuel sources for cooking—fuelwood, kerosene, and agricultural waste. Each biogas plant can reduce 4.6 tons of carbon dioxide equivalent annually. The project will generate approximately 6.5 million tons of carbon dioxide equivalent during the 10-year crediting period. The Community Development Carbon Fund expects to purchase a minimum of 1 million tons of carbon dioxide equivalent with the potential of additional purchase. The project engages household members to understand their needs, the possibilities of the technology, and where to locate it. The project estimates that women will save three hours daily per household using biogas for cooking versus cooking with collected fuelwood. Women use this time for child care, literacy training, and participation in community organizations. Biogas-fueled stoves also dramatically reduce indoor air pollution.

Costa Rica: Solar-powered cookers

The focus of a project implemented by the Fundación Sol de Vida (Foundation of Sun and Life) in the Santa Cruz and Nicoya counties of the Guanacaste region of Costa Rica is to promote the use of solar power for cooking and to build women's capacity for other activities through constructing and using solar cookers. Over 130 households have switched from wood, electricity, or gas to solar cooking, thereby reducing greenhouse gas emissions. The project has reduced the health risks associated with wood burning and reduced women's workload because they no longer collect fuelwood. The project, led almost completely by women, has supported and built women's ability to take action, particularly regarding the environment and livelihood issues. Its work illustrates how women's solar energy can open up new opportunities for women and improve their standing in the community. Because women build the stoves themselves, the project covers only the costs of materials, in addition to small amounts for transportation and instructors for the workshops. After women learn how to build these cookers, they teach others to do the same. Sol de Vida has exported this model to Guatemala, Honduras, and Nicaragua.

India: Large-scale biofuel production

India's National Mission on Biofuels plans to bring 400,000 hectares of marginal land under cultivation of jatropha for biodiesel production (Rajagopal 2007). The biofuels plan considers these marginal lands to be of little ecological or economic benefit. However, these lands, which are common property resources, provide essential food, fuel, fodder, and building materials for the rural poor, especially the most vulnerable (Rajagopal 2007). In India common property resources contribute between 12 and 25 percent of a poor household's income. The poorest households, often headed by women, rely most heavily on these common property resources. Thus, without specific interventions to benefit and include poor men- and women-headed households in the benefits of jatropha production, the livelihoods of the rural poor are likely to decline (Rossi and Lambrou 2008).

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

Understanding and addressing the linkages among gender, environment, and energy undergird the success of bioenergy project development and implementation (UNDP 2007).

- Rural women and men possess different needs and priorities vis-à-vis energy services. Multiple strategies for providing energy to the rural poor are needed, including promoting more efficient and sustainable use of traditional biomass and enabling poor women and men to switch to modern fuels and technologies. The appropriate strategy will depend on local circumstances.
- We must reduce harmful emissions where dependency on traditional fuels will likely continue—for example, in the next two to three decades in Africa (UN-Energy 2007).
- Additional measures may be necessary for small-scale women and men farmers to be included in medium- or large-scale biofuel crop production, such as policies supporting decentralized production, local use of the energy produced, and organization of cooperatives or other forms of participation.
- Subsistence farmers, women in particular, remain less likely to shift their production to bioenergy, particularly if they live in marginal areas and have fewer options to counteract risks and higher discount rates. Organizing small-scale women and men producers' groups can enhance local benefits. Cooperatives can play a useful role in linking large firms to independent growers (as in Brazil and Mauritius). However, projects require rural women's participation in these cooperatives to ensure attention to their needs and concerns.

MONITORING AND EVALUATION

Examples of gender-sensitive indicators in bioenergy include the following (FAO 2007; see also the Monitoring and Evaluation section in the Overview):

- Percentage of women-headed and men-headed rural households with access to electricity, water, markets, and adequate storage facilities
- Percentage of men and women owning and using energy-efficient technologies and low-carbon practices
- Percentage of men and women who participate in decisions about biomass use for energy
- Number of hours spent by men and women in obtaining biomass for household consumption and small-scale enterprises
- Number of men and women producing bioenergy crops.

THEMATIC NOTE 4

Gender and Natural Disasters

The incidence of natural disasters and related environmental disasters has escalated since the 1990s (UN 2001; UNDP 2004).[1] In the first half of 2006 alone, 174 disaster events occurred in 68 countries, affecting 28 million people and damaging property and assets valued at more than $6 billion (UNDP 2007). The effects of earthquakes, landslides, drought, floods, storms, and tropical cyclones severely threaten human survival and sustainable livelihoods and pose a challenge to achieving the UN Millennium Development Goals (FAO/WFP 2005). Disasters cause major loss of human lives and livelihoods and destroy economic and social infrastructure (UN 2002). Climate change, environmental mismanagement, and degradation (including unsustainable exploitation of natural resources) as well as unplanned urbanization and uneven distribution of assets cause increased risk and vulnerability to natural disasters (UN 2002). (The focus of this Thematic Note is on natural disasters; for a wider discussion on crises relating to conflicts and wars, see Module 11. For more on climate change, see Thematic Note 2.)

Natural disasters, often exacerbated by environmental degradation and mismanagement, adversely impact the environment. With sound management, the reverse proves true, thus establishing a direct link between disaster mitigation and environmental management (King 2002). Natural resource degradation leads to an increased frequency of small- or medium-impact disasters, such as recurrent floods or minor landslides, as well as slow-onset disasters, such as land degradation and drought. Human activity has altered ecosystems. The ability to recover from natural disturbance has diminished considerably. For instance, deforestation impairs watersheds; raises the risk of fires, landslides, and floods; exacerbates droughts; and contributes to climate change. Destruction of coastal wetlands, dunes, and mangroves diminishes the environmental buffer system for coastal storms. All these contribute to making at-risk areas such as low-lying islands more vulnerable to extreme weather events (Abromovitz 2001). Although often excluded from databases evaluating disaster impacts, small-scale disasters often account for more aggregate suffering than major ones (UN 2001). Scientists project that these will continue to increase as a result of climate change (Abromovitz 2001).

A growing body of evidence links environmental degradation and competition for natural resources to many of the internal and international conflicts that contribute to many complex emergencies (McNeely 2000). For example, desertification exacerbated the conflict in Darfur because it forced people to migrate from their homes into areas where they competed with others for scarce land and water (Harvey 2007). Severe environmental stress—when accompanied by underlying social or ethnic conflict, poverty, and weak governance—contributes to violent conflict and complex emergencies (UN 2001, 2002).

Although natural disasters strike in the industrialized and developing worlds, developing countries remain the most vulnerable to these risks and sustain greater losses. Countries that face similar patterns of natural hazards—from floods to droughts—often experience widely differing impacts when disasters occur. The impact depends in large part on previous investment in appropriate infrastructure, urban planning, and disaster risk management and reduction policies (UNDP 2004).[2] Within developing countries, the poor and socially disadvantaged remain the most vulnerable. Often the rural poor occupy the most marginal lands, relying on areas prone to drought, flooding, and other hazards for precarious livelihoods. They also face greater exposure to hazards resulting from poor-quality construction material and lack of access to information (Kumar-Range 2001). Rural poverty frequently determines risk for disasters such as flooding or drought (UNDP 2004).

Gender-based inequalities in access to livelihood assets, division of labor, and participation in decision-making processes result in women's and girls' increased vulnerability to the risks of natural disasters.[3] Disaster risk reduction and management interventions must take gender into account to reduce vulnerability effectively. The impacts of natural disasters can be mitigated by using a gender perspective to address their root causes, including social, political, economic, and cultural vulnerabilities (UN 2002).

KEY GENDER ISSUES

Key gender issues include risk and vulnerability to disasters, postdisaster vulnerability, and disaster mitigation, response, and recovery.

Risk and vulnerability to disasters

Natural disasters affect rural women and men differently. Women and girls have limited access to and control over critical assets that provide livelihood security, protection, and recovery, and thus they remain most vulnerable to the impacts of natural disasters. Understanding their different roles and responsibilities—in agriculture, fisheries, and forestry, both within the household and at the community level—can reveal women's and men's different vulnerabilities (Cannon 2002).

Disaster statistics, for which sex-disaggregated data exist, show that women are more likely to die or be injured when disaster unfolds.[4] Women and children are 14 times more likely than men to die as a result of disasters (Aguilar 2008). Women's disaster exposure results from their overrepresentation in highly vulnerable social groups, including the poor and elderly, that are less able to prepare for, survive, and cope with disaster (UN 2004). Additionally for, women do not receive timely warnings or other information about hazards and risks (Fothergill 1998; UN 2001). Mobility restrictions, dress codes, and culturally ascribed roles and behaviors disadvantage women. A disproportionate number of women died in the 1991 cyclone in Bangladesh because of cultural norms restricting their mobility outside the household. Less likely than men to know how to swim, women had few chances of escaping from the affected areas. More women than men died in the tsunami in Sri Lanka because they did not know how to swim or climb trees (Sachs 2007). Recent evidence also suggests that many women who drowned in the tsunami were looking for their children. Existing gender-based inequalities in the allocation of food within the household put women at risk (see also Module 1). For instance, in Bangladesh women's lower nutritional status in predisaster situations worsened during crises (Cannon 2002; Masika 2002). Because they lack mobility and resources, elderly women, those with disabilities, pregnant and nursing women, and those with small children remain most at risk in cases of emergency.

Postdisaster vulnerability

In postdisaster situations women remain more vulnerable than men. Women's responsibilities in caring for household members increase after a disaster, as access to resources for recovery decreases. The daily work involved in providing food, water, and fuel for households after a disaster requires intensive labor. In the aftermath of Hurricane Mitch in Honduras and Nicaragua, women's household and care responsibilities increased, making it difficult for them to return to work (Nelson and others 2002).

In many parts of the developing world, discriminatory customary and social practices curtail women's rights to land. This situation deteriorates after natural disasters. Natural disasters such as hurricanes, tsunamis, and earthquakes damage and destroy land vital to women's and men's livelihoods. Disasters disrupt land ownership and use patterns by killing land titleholders, destroying land records, and erasing boundaries. Other efforts delay and impede the equitable redistribution of land, including the location of refugee camps, the relocation of affected communities, and measures to increase future resilience such as no-construction zones (Brown and Crawford 2006). Poor and marginalized women and men often have little alternative but to remain in or return to disaster-prone areas (Masika 2002).

Natural disasters frequently result in the degradation of water sources. Children and pregnant women are particularly susceptible to diseases such as diarrhea and cholera that thrive in such conditions. Because of their roles in managing household water supply and domestic chores, women take greater risks.[5] Women's health may also suffer as a result of reduced nutritional status when their workload increases. For instance, in Peru following the 1997–98 El Niño events, malnutrition among women caused peripartum illness. Flooding or rise in temperature in highland areas can extend the range of vector-borne diseases, such as malaria. Also, HIV and AIDS and other diseases can exacerbate the disaster risks brought on by climate change, urbanization, marginalization, and conflict (UNDP 2004). Health problems during disasters have psychological components as well as physical ones. Rural women and men victims of disasters may suffer from a variety of psychological problems

related to loss of family members, trauma, unemployment, and identity (Graham 2001).

To cope with small- and medium-scale, and slow-onset disasters, women (and girls to some extent) often take on additional roles and responsibilities. With water shortages and depletion of forests (as a result of wildfires, droughts, desertification, land degradation, and other occurrences), women and girls walk longer distances to collect water and fuelwood, sometimes far from the safety of their households. This decreases the time available for food production and preparation, with consequences for household food security and nutritional well-being. Girls sometimes leave school to help with the increased work burden. Food distribution in refugee camps has resulted in a significant drop in girls' schooling rates.

As a result of slow-onset disasters such as land degradation and drought, men's out-migration has increased in some parts of the developing world. In Brazil, for example, people call women household heads "widows of the drought" (Branco 1995). Women left behind take on men's traditional roles and responsibilities, increasing their work burdens, but without having equal access to financial, technological, and social resources (Lambrou and Laub 2004). In some regions women's out-migration accompanies drought, such as in Australia, where women migrate to urban areas to seek additional income while their husbands remain on the farm (Alston 2006).

According to some estimates, 25 million environmental refugees have lost their homes because of environmental degradation or localized conflicts related to competition for resources (Tickell 2001). Uprooted populations generally encounter problems of protection and safety, with women in particular suffering sexual and physical abuse. Areas outside camps where women gather fuelwood and water can present dangers. Families frequently select girls to collect fuelwood used for the preparation of food inside refugee camps, and girls receive food in return. Women experience more violence while displaced than in normal circumstances, and violence against women increases in postconflict situations (FAO/WFP 2005). When displaced, women in particular frequently find themselves stateless and dependent on external assistance (Graham 2001). Gender and age determine entitlements to relief supplies, and access to food based on household registration procedures favors men in some settings.

Disaster mitigation, response, and recovery

People regularly cope with all kinds of "daily" disasters and have developed local strategies for reducing risk and responding to natural disasters (UN 2001).[6] Although women and children remain most vulnerable, many women at local levels mitigate hazards and strengthen the disaster resilience of households and communities. In Central America, the Caribbean, and other regions where the proportion of women-headed households is high and women actively engage in economic activities, women assume leadership roles in situations such as food distribution that require organizational and administrative capacities, impartial judgment, and social commitment (Toscani 1998).

Responses by men and women before, during, and after disasters relate to their status, roles, and position in society (Kumar-Range 2001). Most studies show that women's and men's responses to a disaster follow traditional gender lines (Fothergill 1998). Women take responsibility for child care, household, and supportive tasks, whereas men take leadership positions. Men usually participate in the public sphere in formal emergency and planning operations, and they discourage women from participation in critical planning and preparedness decisions.

Household organization also affects resilience. In responding to and recovering from disasters, social and kin networks determine available strategies (Kumar-Range 2001). Women-headed households remain the most economically and politically disadvantaged in gaining access to these networks (Graham 2001). In addition, rural poor women and men often lack savings or assets to ensure them against external shocks (Masika 2002).

Emergency decision-making processes after disasters often exclude women. Women's limited participation restricts their engagement in political decisions that impact their specific needs and vulnerabilities. Relief workers view women as victims rather than potential agents of change, which leads to the reconstruction of gender inequalities. For example, failure to recognize women's informal sector work may reduce their access to economic recovery assistance and undermine perceptions of women as full contributors to the recovery process. To take an active part in shaping projects that meet their needs, women must participate. Men are also at risk. Failure to recognize men's socioeconomic and emotional needs may delay men's long-term recovery (UN 2001, 2002).

POLICY AND IMPLEMENTATION ISSUES

Natural disasters and environmental management appeared on the international agenda throughout the International Decade for Natural Disaster Reduction (1990–2000). The Yokohama Conference in 1994 strongly emphasized the

links between disaster reduction and sustainable development. It also recognized the need to stimulate community involvement and the empowerment of women at all stages of disaster management programs. Additionally, the Beijing Platform for Action (1995) and the twenty-third special session of the United Nations General Assembly (2000) viewed a gender perspective as integral to natural disaster mitigation (Enarson and Meyreles 2004). In 1999 the United Nations Inter-Agency Standing Committee issued a policy statement that requires all member organizations to mainstream gender when providing humanitarian assistance in emergencies. In 2005 the World Conference on Disaster Reduction emphasized integrating a gender perspective into all disaster risk management policies, plans, and decision-making processes.

A recognition of the social dimensions of disasters has resulted in increased attention to community involvement and ownership. However, gender perspectives in policies and strategies to prevent and respond to natural disasters (CSW 2002) have not yet received adequate attention.

Postdisaster reconstruction presents the opportunity to challenge existing gender relations and empower women to better respond to this challenge. Immediately following a disaster, the political climate lends itself to much-needed legal, economic, and social change in such areas as governance, land reform, skills development, employment, housing, and social solidarity (UN 2002). However, an excessive focus on relief assistance may obscure or compromise efforts to challenge these roles. Emergency relief used inappropriately may discourage independence and undermine local coping strategies. These strategies result in the reconstruction of vulnerability rather than the promotion of more equitable and sustainable conditions during the postdisaster window of opportunity for social change (UN 2001).

Major research gaps exist on the linkages among gender, environmental management, and disaster risk reduction at all levels—from climate change to local, small emergencies. Further work must examine gender-based differences in vulnerability, livelihood impacts, and specific needs during disasters (UN 2001).

GOOD PRACTICES AND LESSONS LEARNED

Interventions and life-saving strategies may succeed when gender differences have been properly understood and addressed (FAO/WFP 2005). The following examples of good practices and lessons learned from relevant projects take gender issues into account.

Safe access to fuelwood and alternative energy in humanitarian settings

An interagency program aims to promote safe access to fuelwood and alternative energy in humanitarian camps.[7] When women leave camps to collect wood, they often experience gender-based violence. In Chad all humanitarian efforts include efforts to reduce gender-based violence. In Rwanda and Tanzania programs support safety improvements. In Sudan some women have successfully transitioned to the use of mud-based fuel-efficient stoves in the camps. In Indonesia policies promote access to sustainable timber and minimize illegal logging caused by demand for shelter. Large concentrations of displaced populations in camps place excessive pressure on already degraded natural resources. This endangers the food security and livelihood of nearby local communities and fosters resentment and controversial relations with the host population. People compete for charcoal and wood for fuel and timber for shelter construction. Alternative sources of energy have had a positive impact on the livelihoods of women and men. These alternative sources have reduced women's and girls' time and workload for fuelwood collection and have reduced the risk of gender-based violence.

Nepal: Community-based disaster management project

The UNDP currently implements a community-based disaster management project in Nepal aimed at disaster risk reduction. It represents a clear shift from postdisaster rescue and relief to predisaster mitigation and preparedness and mainstreaming disaster risk reduction. The main goals of the community-based disaster management project are to enhance the safety of women and men vulnerable to natural disasters and to protect common property and community resources in select disaster-prone districts. The project uses participatory approaches and capacity-building measures and aims to enhance the capacities of stakeholders at the community, district, and national levels in different aspects of disaster management. Additionally, the project focuses on supporting specific disaster mitigation measures to reduce the vulnerability of women-headed, displaced, and poor households. Activities include 50 percent women's participation in training and education on HIV and AIDS, violence against women, and trafficking related to vulnerability during natural disasters.

Pakistan: Building capacity to cope with disasters

Pattan, a local NGO in Pakistan, increases community capacity to cope with disasters through supporting social

organizations and developing local institutions. Previously Pattan worked in flood-prone areas that have unrepresentative community organizations dominated by local power elites, usually men. The NGO worked with the community to organize representative, democratic forums called Pattan Dehi Tanzeems (PDTs) that made collective decisions. Barred by local tradition from joining the PDTs, women formed separate PDTs and overcame resistance to their participation. Pattan used the disruptive nature of floods to develop institutions enabling women to make key decisions. The 1992 floods completely destroyed many villages, and so the NGO initiated a project to rehabilitate houses in which women participated in the PDTs. In Pakistan women maintain traditional (*kacha*) housing. The project involved women in the design and construction of improved (*pakka*) housing. Households received loans, and women took responsibility for collecting money to repay loan installments. Initially, men objected to giving women this responsibility, but the NGO developed an easy-to-use monitoring system. The NGO introduced the concept of joint ownership of the new *pakka* housing. It took time for the concept to take hold, but men eventually saw the value in joint ownership. The experience of the housing project has given women confidence to take collective action in many other projects (Bari 1998).

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

Understanding the gender dimension in disaster-related development processes requires addressing root causes and ensuring equitable and efficient risk reduction measures (UN 2002). A gendered approach considers (1) the specific roles and responsibilities of men and women in food security and agriculture, (2) their main constraints and needs, and (3) their ability to carry out activities under emergency situations and early rehabilitation (FAO/WFP 2005). The following are important principles of disaster management (see box 10.10 for additional guidelines):

- Understand gender-based differences in vulnerability and in livelihood impacts in natural disasters, including small- and medium-scale and slow-onset disasters.
- Consider gender divisions of labor, time-use patterns, additional workload, and gender-based asymmetries in accessing and controlling livelihood assets (FAO/WFP 2005).
- Recognize that community-based preparedness and response must consider women's and men's different physical and socioeconomic vulnerabilities to reduce their exposure to the adverse effects of climate change

Box 10.10 General Guidelines for Disaster Management

- Create and implement, with the involvement of community groups and women's groups, comprehensive rural and urban development strategies and land-use plans that provide opportunities to mitigate damages caused by hazards.
- Include gender-based hazard mapping and social and environmental risk assessment at the appraisal stage of all development projects, involving women and men equally at all levels of the assessment.
- Systematically include hazard proneness and gender-based vulnerabilities in environmental impact assessments and formulate disaster reduction measures where appropriate, with particular regard to the protection of lifeline infrastructure and critical facilities.
- Promote agricultural technologies and give specific regard to addressing, from a gender perspective, environmental degradation hazards that threaten food security.
- Recognize the expertise and local knowledge of women and men disaster survivors and empower them in the management of social and environmental hazards and prevention of disasters.
- Target disadvantaged groups and households, and raise their awareness of women's human rights and the critical role women play in coping with natural disasters.
- Increase women's access to risk management information through gender-sensitive early warning systems and target specific social groups for warning information to address gender-specific needs and circumstances.
- Collaborate in the creation of networks that promote community access to gender-sensitive information and communication technologies that support information exchange on environmental management and disaster risk reduction.
- Establish appropriate channels and mechanisms for information flow and dialogue that women and men in disaster-affected areas may access.

Source: UN 2001.

(Lambrou and Piana 2006). The participation and involvement of local women and men are essential.

- Create early warning systems and monitoring based on detailed information to minimize exposure to vulnerabilities and ensure preparedness. One strategy to increase preparedness is the creation of risk maps, including gender-based hazard maps (UN 2002).
- Factor the effects of food aid, subsidies, and rehabilitation programs on women as the principal providers of food for the household. In documentation and registration procedures, women should have the right to register in their own names. Devote attention to ensuring that women household heads receive benefits (FAO/WFP 2005).

MONITORING AND EVALUATION

Monitoring and evaluation processes enable staff to analyze the performance of emergency operations. Indicators include the following (FAO/WFP 2005):

- Percentage of aid targeted to the different needs of affected men and women
- Percentage of women elected and appointed to village committees
- Roles of women members in distribution committees (for example, weighing, rebagging, and monitoring that people actually got their entitlements) and whether this made the distribution fairer
- Percentage and number of women and men who benefited from the relief project
- Percentage of women and men who migrate and the impact of migration on the recovery pace within the village
- Impact on women's income and livelihood options (for example, income-generating activities and new employment opportunities)
- Ratio of the number of women to men who received emergency project relief and distributed food rations to their families.

THEMATIC NOTE 5

Gender Dimensions of Land and Water Degradation and Desertification

Land degradation affects more than 900 million people worldwide and as much as two-thirds of the world's agricultural land (UNDP 2007a). Unsustainable land use and climate change drive land degradation, including soil erosion, nutrient depletion, water scarcity, and desertification.[1] Land degradation leads to the loss of plant and livestock genetic and species diversity, important sources of food, medicine, and commercial products (UNDP 2007a). Increased irrigation and expansion of agricultural land into former dry-season grazing areas exacerbate land degradation (FAO 2002). In Africa, 36 countries face dryland degradation or desertification (GEF 2003).

If present trends continue, 1.8 billion people will live in countries or regions with absolute water scarcity by 2025, and two-thirds of the people in the world could be subject to water stress.[2] The decline in quantity and quality of water leads to overexploitation of surface and groundwater resources and magnifies problems related to desertification. Water crises raise political tensions in many parts of the world, particularly where people share rivers and lakes across borders. Africans have the least access to clean water; the largest numbers of people with no access to basic sanitation live in Asia (UNDP 2005). Competition for increasingly precious water resources has intensified dramatically over the past decades. Water shortages, water quality degradation, and aquatic ecosystem destruction seriously affect economic and social development, political stability, and ecosystem integrity (UNDP 2005).

Desertification has emerged as one of the most pressing global environmental challenges facing the world today.[3] Drylands occupy 41 percent of the Earth's land area and are home to more than 2 billion people, 90 percent of whom live in developing countries.[4] Dry and subhumid lands present unique landscapes containing a wide variety of biodiversity well adapted to the often harsh conditions that characterize these areas (CBD 2007). Some 10 to 20 percent of drylands have already degraded, with a much larger number under threat from further desertification (MEA 2005). Desertification, which leads to loss of production capacity, reduces the land's resilience to natural climate variability and may temporarily affect climate change (UNCCD 2005). It results in persistent reductions in the capacity of ecosystems to provide services such as water, fuel, nutrients, soil fertility, and other necessities. Observers have seen a major decline in the well-being of women and men living in drylands (MEA 2005). Desertification contributes significantly to food insecurity and famine, the internal displacement of people, and international migration, and it creates environmental refugees who add stress to areas that may not yet have degraded.[5]

Pastoralists and farmers in drylands try to maximize herd size and crop production during good periods and to minimize losses and obtain some yield during periods of drought. Pastoralists may follow seasonal variations in vegetation by moving their livestock, sometimes over long distances. Resilience against fluctuations may mean bridging drought periods by drawing on local reserves, such as using different types of seeds or other adaptable genetic resources. Knowledge of local biodiversity minimizes risks in the face of land and water degradation. Rural women and men's reliance on a variety of genetic resources, including plant varieties and livestock breeds, allows them to adapt their agricultural systems to changing environmental, economic, and social conditions. For instance, livestock helps provide a safety net when other sources of income are no longer available.

Desertification causes rural poverty, just as rural poverty contributes to desertification. Poverty induces women and men to increase pressure on deteriorating drylands and to exploit the natural resource base in unsustainable ways. This accelerates land degradation, leading to a reduction in productivity and incomes while decreasing the livelihood

options for poor rural women and men. The result is food scarcity, malnutrition, and economic and social instability, which increase poverty and further exacerbate pressure on the natural resource base.

Policies, programs, and projects implemented at the local, international, and national levels often fail to account for land and water degradation and desertification when addressing poverty and sustainable development.[6] Land degradation and desertification cannot be addressed in isolation from other efforts to protect biodiversity, water resources, food security, and energy security and to combat climate change.

KEY GENDER ISSUES

Combating desertification and reversing land and water degradation will help secure the livelihoods and overall well-being of women and men farmers and pastoralists. Land and water degradation impacts poor rural women and men most severely, because they directly depend on these resources for securing food and livelihoods (Lambrou and Laub 2004). When drylands become degraded, rural women and men become vulnerable to food insecurity, malnutrition, disease, and loss of livelihoods (FAO 2003). Gender-based inequalities make rural women and girls more vulnerable than men. Caste, ethnicity, and other socioeconomic considerations interact with gender to make certain groups of women and men particularly vulnerable.

Rural women and men have different roles, responsibilities, and knowledge in managing natural resources. Consequently, the impact of land and water degradation on rural household members will vary according to gender. This division of labor results in women's and men's different priorities for water use and management. Men typically use water for agricultural production, principally for irrigating cash crops. Women play an important role in water management as collectors, users, and managers of water (FAO 2007a), and they use water for both agricultural and household purposes. As previously discussed, the task of providing domestic water almost always falls to women and girls. Women also water some subsistence crops and vegetable gardens and spend considerable time collecting water for household use (for example, food preparation, drinking, and sanitation). Water collection makes up a large part of rural women's work in Asia and Africa. In Senegal women spend 17.5 hours each week collecting water, whereas in Mozambique they spend 15.3 hours in the dry season. In Nepal girls play an important role collecting water, averaging five hours per week (Crow and Sultana 2002). In rural Africa and India, 30 percent of women's daily energy intake is spent in carrying water (Ray 2007).

Depletion of land and water resources may place additional burdens on women's labor and health as they struggle to seek their livelihoods in a changing environment. Land degradation, water degradation and scarcity, desertification, and deforestation often cause women and girls to walk longer distances to collect fuelwood and water, with consequences for their health and sometimes exposing them to violence. In some cases, such as in Bangladesh, extraction of groundwater for irrigation has made drinking water pumps dry up (Crow and Sultana 2002).

Through their different tasks and responsibilities, rural women and men have accumulated knowledge and skills concerning the management and use of biodiversity in dryland ecosystems. This includes knowledge of local crop varieties, animal breeds, tree species, agricultural systems, and the medicinal and nutritional values of plants. Adept at managing their own scarce resources, rural women and men living in drylands have developed coping strategies to deal with periods of scarcity. Local knowledge provides a wide range of accumulated experience on how to manage natural resources in farming and grazing (UNCCD 2005). Rural women's and men's local knowledge proves crucial to the conservation, use, and management of drylands, including its biodiversity.

In southern and eastern Africa, some HIV- and AIDS-affected households have turned to livestock production as an alternative to crop production. People adopted this strategy when soils became infertile and crop management practices too demanding for the available labor. Other households sell cattle to pay for medical bills and funeral expenses. In pastoral societies, in which milk provides a major component of nutrition, selling cattle can contribute to malnutrition. Some households raise small livestock, such as poultry, which is a less labor-intensive practice and is often the responsibility of women (White and Robinson 2000).

Insecure land tenure reduces rural women's and men's incentives to make long-term investments in soil rehabilitation and conservation, which are crucial to drylands management. A reduction of agricultural productivity and more competition for relatively productive land leave women with the more marginal, fragile lands. The impact of environmental degradation on common property resources in drylands threatens household food security and livelihoods. Poor rural women who lack secure land tenure depend on these common resources for fuelwood, fodder, and food—and, therefore, the well-being of their households.

The projected increase in freshwater scarcity will cause greater stresses in drylands. Water shortages not only undermine agricultural production but also threaten the health of affected households. Local norms and customary practices can limit women's rights to water resources (Gender and Water Alliance 2003). Access to water depends on land rights, control over resources, and social networks, all of which more severely restrict women than men (IFAD 2006).

Excluding women's roles and perspectives in water and land management interventions will have adverse effects. For instance, an inappropriate design or location of tap stands or wells may increase the time women spend collecting water (FAO 2007a). Many projects emphasize participation of men and women in water management associations. A study in India found that (1) even when women are on water management boards, they choose not to attend meetings and send men relatives instead, and (2) women in different castes often have different needs for water, with elite women's preferences determining the placing of hand pumps and thus decreasing poor women's access to water (Singh 2006).

In southern and East Africa, HIV and AIDS have led to increased tenure insecurity for women and children. As women become widows and children lose their parents to AIDS, the incidence of "property grabbing" increases. The perpetrators are not always women; in some regions of Namibia and Zambia, sisters-in-laws are the main perpetrators (Izumi 2007). Most often, a husband's relatives take land and other productive assets from the deceased's widow or children.

POLICY AND IMPLEMENTATION ISSUES

The international community has long recognized that desertification presents a major economic, social, and environmental concern to many countries in all regions of the world. In 1977 the United Nations Conference on Desertification adopted its "Plan of Action to Combat Desertification." The United Nations Environment Programme concluded in 1991 that the problem of land degradation in arid, semiarid, and dry subhumid areas had intensified (UNCCD 2005). To tackle the problem of desertification with renewed efforts, the international community adopted the United Nations Convention to Combat Desertification (UNCCD) in 1994. The convention stresses the importance of a bottom-up participatory approach in identifying, implementing, monitoring, and evaluating projects that combat desertification and mitigate the effects of drought. The UNCCD recognizes the role of women in rural livelihoods, explicitly encouraging the equal participation of women and men (Lambrou and Laub 2004).

The Convention on Biological Diversity (CBD) also acknowledges the importance and uniqueness of the biodiversity of dry and subhumid lands.[7] In 2000 the CBD Conference of the Parties emphasized the importance of increasing the knowledge base and supporting best management practices on dry and subhumid lands; the CBD also recognized the need for the full participation of women at all levels of policy making and implementation.[8] The World Summit on Sustainable Development reaffirmed land degradation as one of the major global environment and sustainable development challenges of the twenty-first century, calling for action to address causes of desertification and land degradation and to restore land and address poverty resulting from land degradation (GEF 2003).

Linkages among biodiversity, poverty alleviation, and gender issues remain intertwined with land and water degradation and desertification. Because they consider it "nonscientific" or inferior, practitioners overlook or ignore rural women's and men's local knowledge on the conservation and sustainable use of natural resources.

GOOD PRACTICES AND LESSONS LEARNED

Involving women in participatory land and water management promotes more sustainable land and water use, reversal of desertification, and improved socioeconomic conditions (Aswani and Weiant 2004; Nyssen and others 2004). Projects that adopt a bottom-up participatory approach create an "enabling environment," designed to support local women and men in achieving livelihood security.

Asia: Farmer-Centered Agricultural Resource Management

Supported by the UNDP and implemented by FAO, the Farmer-Centered Agricultural Resource Management (FARM) program was implemented in China, India, Indonesia, Nepal, the Philippines, Sri Lanka, Thailand, and Vietnam.[9] Between 1993 and 1998, the program aimed to promote sustainable use and management of natural resources in agriculture and household food security in ecologically fragile, rain-fed areas. Recognizing that women farmers contribute significantly to agriculture, the program promoted women's participation in decision-making processes and other activities at all levels. FARM adopted a participatory assessment planning (PAP) approach that incorporated a gender analysis tool—a practical tool for

examining activities, problems, knowledge, and access to natural resources of both women and men. The output of the PAP approach resulted in greater accountability and equitable sharing of benefits and ownership of assets. FARM also carried out training of trainers under FAO's Socio-economic and Gender Analysis Program (SEAGA). The emphasis on gender has created awareness and improved understanding of social-equity issues among community members. Women have begun to play important roles in decision making and leadership management.

China: Wulin mountains minority-areas development project

This joint IFAD–World Food Programme project aimed to increase food and cash crop production through a range of land-improvement activities. These included the conversion of dryland to paddies, improvement of livestock and fish production, and literacy and numeracy training for women. Improved drinking water supply systems and the introduction of labor- and time-saving technologies reduced women's workloads. Small livestock husbandry provided additional income for food, school fees, and clothing, and drinking water systems and training improved hygiene and health. Women gained self-esteem and social position with their entrepreneurial success.

Egypt: Matruh Resources Management Project

The Matruh Resources Management Project, funded by the World Bank, seeks to break the cycle of natural resource degradation and poverty in the fragile ecosystem of Matruh, Egypt, in which Bedouin women play a critical role in rural production and environmental management. The project works closely with community groups to define the needs of women and men and ensure participation in preparing and implementing local resource management plans. To fulfill these objectives and enable the community groups to address gender issues effectively, project staff received early gender training. In addition, women extension agents based in each subproject area work directly with women.

The Gambia: Partial participation by women in irrigation program

Efforts undertaken through development initiatives have rarely succeeded in providing women farmers with secure access to irrigated assets.[10] Sometimes women obtain access indirectly or acquire irregular or seasonal access, but even when they do obtain use of irrigated land, they may end up losing this access. When IFAD-funded drylands projects attempted to ensure better access for women to irrigated land (for example, by designating the land only for women's crops), men sometimes took over the crops, as in a rice irrigation project in The Gambia. However, "partial participation" by women in irrigation projects may still benefit women. Women's consumption of water improved, even though their control of assets and status did not increase. Women may also use water for their livestock or their domestic needs, even though they cannot use it for their crops. Indirect or limited access to irrigation water may somewhat improve their livelihoods in the short term.

Mauritius and Rodrigues: Capacity-building for sustainable land management

The UNDP implemented this three-year, $1.38-million project (including a Global Environmental Facility grant of $600,000) to design sustainable land management capacities in appropriate government and civil society institutions and user groups.[11] The project's long-term goal was to ensure that agricultural, pasture, forest, and other land management efforts in Mauritius and Rodrigues consist of sustainable, productive systems that maintain ecosystem productivity and ecological functions while contributing directly to economic and social well-being. Women participated actively in stakeholder consultations during the project's formulation. Women represented 31 percent of overall participation at the inception workshop, where they voiced their needs and contributed their perspectives. Since that time, the project has ensured a good balance of women and men in training courses and other activities. A gender specialist conducts capacity-building exercises to ensure that the project takes gender issues into consideration in all UNDP-supported projects, including sustainable land management.

Niger: The Keita Project

The Keita Project, financed by the Italian Government and implemented by FAO with support from the World Food Programme, aimed at combating desertification in the Keita region of Niger. The project adopted a gender-sensitive participatory approach that led to better understanding of local land-use systems and husbandry. Its aim was to facilitate women's access to income-generating activities (garden and fruit production, sheep production) and promote their participation in local and national-level organizations and

activities. Time-saving technologies introduced by the project alleviated women's work burden.

GUIDELINES AND RECOMMENDATIONS FOR PRACTITIONERS

An assessment of gender-specific relationships to natural resources and of gender-differentiated impacts of land and water degradation and desertification will facilitate the development of effective projects related to land and water degradation and desertification. The following guidelines are of particular importance:

- Understanding the gender-based inequalities in accessing livelihood assets, in the division of labor, and in participation in resource planning and management provides a sound basis for the sustainable management of land and water.
- To understand the gender-differentiated vulnerabilities and coping strategies in relation to land and water degradation and desertification, we must identify changes in land use, land scarcity, and the economy that affect the ability of women and men to meet their livelihood needs.
- The success of sustainable land and water management requires women's and men's full and equal participation, through incorporating local women's and men's perspectives, needs, and priorities. In some cases, women can benefit from partial participation. Efforts to encourage women's participation in decision-making processes and organizations should take into account women's time and mobility restrictions. Serious efforts should ensure that women's participation goes beyond tokenism. In addition, these efforts must acknowledge that women from different castes and classes may have different interests and power in making natural resource management decisions such as where to locate pumps.
- Strengthening the capacity of women and men users and managers of drylands resources remains one of the most important factors in reversing land and water degradation. Participatory processes and innovations in community-based planning and decision making work best to build capacity. Women must gain leadership positions, participate in organizations, and gain access to technology. Strengthening women's group-based lending has sometimes enabled women to overcome requirements for collateral. Credit activities served as entry points for organizing women for broader activities (IFAD 2006).

MONITORING AND EVALUATION

Examples of gender-sensitive indicators include the following (FAO 2007b):[12]

Land:

- Average number of hectares of land owned by women-headed and men-headed households
- Percentage of women and men with de facto and de jure land rights
- Number of women and men with decision-making authority in cooperatives and marketing associations
- Ratio of number of men and women with access to credit based on land rights.

Water:

- Ratio of women and men who are members of water users associations
- Ratio of number of irrigated farms managed by women and men
- Change in the number of hours of labor required by men and women with the introduction of irrigation projects.

INNOVATIVE ACTIVITY PROFILE 1

Gender, Biodiversity, and Local Indigenous Knowledge Systems (LinKS) for Food Security

PROJECT OBJECTIVES AND DESCRIPTION

The goal of the LinKS project was to improve rural women's and men's food security and promote the sustainable management of agrobiodiversity.[1] To achieve this goal, the organizers raised awareness of how rural men and women use and manage agrobiodiversity and promoted the importance of local knowledge for food security and sustainable agrobiodiversity at local, institutional, and policy levels. They worked with a range of stakeholders—development agents, researchers, and extension services—to strengthen their ability to recognize and value women and men farmers' knowledge and use gender-sensitive and participatory approaches in their policies, programs, and interventions.

Launched in 1997, the project, funded by the government of Norway and administered by FAO, operated in Mozambique, Tanzania, and Zimbabwe. Activities in Swaziland began in 2000 and continued until the end of September 2005.

The main strategy of the project was to support, build on, and strengthen the efforts of other groups already working on food security, indigenous knowledge, and agrobiodiversity issues in the four countries. These other groups included NGOs, research, training, and academic institutions; government agencies; and policy institutions. The project teams and management used participatory approaches in project design, formulation, and implementation activities.

The project operated through three central areas of activities:

- *Capacity building and training* to raise awareness and develop tools and methods to enhance capacity, change development practitioners' attitudes about rural women and men's local knowledge, and stress the importance of this knowledge for sustainable management of biodiversity and food security
- *Research on gender-based differences* in farmers' knowledge and management of biodiversity, highlighting the role of agrobiodiversity management for food security, and the different roles and responsibilities of rural women and men in the use and management of agrobiodiversity
- *Communication and advocacy* to enhance the exchange of information about the value of local knowledge in agriculture between communities, as well as with institutions that work with farmers and policy makers.

What's innovative? The LinKS project played an important role in shedding light on how food security will have to build much more on local knowledge and agrobiodiversity with a clear understanding of gender implications, keeping in mind the continuously changing global socioeconomic and political conditions. The participatory management style, together with a holistic approach, represented a new and innovative approach for FAO in project implementation.

INNOVATIVE FEATURES

The LinKS project was conceived in response to the emerging international debates on the sustainable management of natural resources and participatory approaches during the early 1990s culminating in the 1996 International Technical Conference on Plant Genetic Resources for Food and Agriculture. In the period leading up to 1996, the understanding of gender and local knowledge systems and the rich source of information embodied in the knowledge, skills, and practices of women and men as managers and users of biodiversity were not very clear. Agricultural and rural development programs and policies, in particular those related to natural resources management, often failed to take into account

rural women's and men's local knowledge systems in farming activities (Rocheleau 1996; Shiva 1996). Furthermore, research, science, and national policies tend to undermine the value of local knowledge, capacities, skills, and innovations of local farming communities to sustain and manage agrobiodiversity and secure food. The misconception that local knowledge proves inferior to scientific and technical approaches leads to a marginalization and loss of local practices and knowledge.

The LinKS project evolved with the aim to bridge this gap between local and scientific knowledge (box 10.11).

BENEFITS AND IMPACTS

The project enhanced the capacity of participants in understanding the linkages between local knowledge, gender, and agrobiodiversity and incorporating these issues in their work through the use of gender-sensitive participatory approaches. Workshops organized to document traditional practices emphasized, first, the potential benefits and risks of sharing such knowledge, and, second, the responsibilities of researchers and development agents to record and document local knowledge. Several specific training workshops were organized to strengthen knowledge and skills in implementing gender-sensitive participatory agricultural and livestock research and training. Other capacity-building activities included the following:

- About 1,125 people participated in the training workshops on gender, local knowledge, and biodiversity and the application of gender analysis and participatory methods.
- A training manual, *Building on Local Knowledge, Gender and Biodiversity,* highlighted the specific concepts and links between these issues from the perspective of sustainable livelihoods.
- A local pool of experienced trainers was built up to facilitate with the training workshops on LinKS issues and gender-sensitive participatory approaches.
- Integration of local knowledge, gender, and agrobiodiversity issues in the educational curriculum of local training colleges, universities, and other institutions of higher learning (such as the Sokoine University of Agriculture).
- Visits provided farmers, researchers, NGO representatives, and development workers an opportunity to exchange ideas and experiences, and to take part in mutual learning experiences. In Tanzania, as part of a research project focusing on the management of animal genetic resources by the Maasai, pastoralists from various study areas exchanged visits to share experiences and views.

The project also supported 28 research activities that documented and increased understanding of the linkages between local knowledge, gender, and agrobiodiversity; reinforced collaboration between researchers and rural communities; demonstrated the complementarities between the local and scientific systems of knowledge; and enhanced the potential of developing approaches to increase food security and agrobiodiversity. The stakeholders identified three broad topics as particularly important: (1) traditional seed systems (box 10.12), (2) animal production and genetic diversity (box 10.13), and (3) the relation between HIV and AIDS and local knowledge systems (box 10.14).

Box 10.11 Linkages between Local Knowledge, Biodiversity, Food Security, and Gender Issues

Biodiversity serves as one of the most important natural assets for poor rural women and men. They rely on a diverse range of natural resources—crops, trees, livestock, fish—for subsistence production and sale. Yet, because of environmental stresses, introduction of new improved varieties and marginalization of local knowledge, biodiversity is lost at a rapid rate, posing a grave threat to long-term food security.

The different tasks and responsibilities of rural women and men result in accumulation of different types of local knowledge and skills. This local knowledge shapes and influences plant and animal diversity at both the gene and species levels. It also provides an important coping strategy for poor rural women and men vulnerable to the risk of environmental degradation and natural disasters. For instance, poor rural women and men farmers often spread risk by growing a wide variety of locally adapted crops, some of which will be resistant to drought or pests.

Thus, local knowledge, gender, and agrobiodiversity are closely interrelated.

Source: FAO 2005.

Box 10.12 Tanzania: Traditional Seed Systems

Research activity on gender and biodiversity was set up in the southern highlands of Tanzania, a region heavily exposed to improved seed varieties. The goal was to improve the availability and accessibility of high-quality seeds of crop varieties preferred by farmers to enhance household food security. The main findings at the end of the project were the following: (1) some crop species had disappeared because of changes in weather, migration, government policies and interventions, or farmers' preferences; (2) many varieties had been introduced; (3) in general, agrobiodiversity increased over the years; (4) levels of food consumption and their composition varied within the different socioeconomic groups; (5) food-secure households relied more on staple food and less on natural and collected crops; and (6) the informal system provided a better source of seeds and information for many farmers than the formal seed system.

Source: Author.

Box 10.13 Tanzania: Animal Production and Genetic Diversity

In the Mbarali district, a study was conducted to gauge local knowledge on breeding and selection of livestock in the Maasai community. The study examined the types of animals (cattle, sheep, goats) preferred and the criteria used to achieve the desired traits. These preferences were analyzed in relation to gender and age, roles and responsibilities, decision making, and goals of food security and herd survival. The objective was to let the Maasai pastoralists identify the gaps and make corrections. The threats or constraints to the pastoralists' local knowledge for the sustainable management of indigenous livestock were identified, and possible solutions offered. The decreasing grazing land and water for livestock in the Mbarali district and livestock diseases were major constraints. (See also Module 14.)

Box 10.14 The Relation between HIV and AIDS and Local Knowledge Systems

A study on the impact of HIV and AIDS on local seed systems in both Mozambique and Tanzania showed the gender specificity of local knowledge. Men and women are responsible for different crops; for example, a widower would not necessarily know or be able to produce, after his wife's demise, the local crops she had planted. Her specific knowledge about local seed varieties would be lost. HIV and AIDS constitute a severe threat to agrobiodiversity. At the request of four communities in Tanzania, several local seed fairs enabled farmers to share and exchange their local knowledge and local seed varieties.

Source: FAO 2005.

The project's communication strategy increased the visibility of women's and men's knowledge among communities, development workers, and policy makers. Communication activities conducted through participatory processes included the following:

- A total of 787 researchers, policy makers, and development workers participated in workshops and seminars organized to raise awareness and facilitate discussion of the issues.
- Small workshops explored farmers' rights and intellectual property rights. Through these workshops, the project fostered discussion of local knowledge and its link to biodiversity conservation and food security in each of the project countries.
- Twenty short case-studies, 33 research reports, and two videos were disseminated to project partners through training workshops, seminars, and the LinKS project mailing list.
- Agricultural fairs, contributions to national television and radio programs, national newspapers, and specialist magazines were given support.
- A Web site (www.fao.org/sd/links/gebio.htm) provides useful resources and links to information sources.

LESSONS LEARNED AND ISSUES FOR WIDER APPLICABILITY

The project's thematic focus and the scope of its activities, as well as the number of countries involved, made it a com-

plex project to implement. Addressing and linking the main themes of gender, local knowledge, and agrobiodiversity brought conceptual and analytical challenges as well. *Gender-sensitive participatory approaches* proved to be the most valid approach to achieve the project objectives.

The project adopted a *holistic, interdisciplinary approach* for understanding the linkages between gender, local knowledge systems, and agrobiodiversity management for food security. Research activities were designed in a process-oriented way to include the active involvement of all disciplines in planning, implementation, analysis, and interpretation. Because ministries, universities, and most NGOs traditionally work within a sectoral approach, such a multidisciplinary approach proved extremely challenging,

Project partners experienced difficulties grasping the conceptual themes and applying them to their work. Despite intensive training, the application of concepts to field work and data analysis remained unclear to researchers. Consequently, researchers participated in pre-field training to ensure that they were able to document local knowledge in such a way that local communities benefited. Training workshops focused on the application of gender-sensitive participatory tools. It became clear that workshops were not sufficient to increase understanding of the concepts and their linkages; thus, a training manual was developed to address this gap.

The participatory management style of the project presented limitations due to existing institutional frameworks and bureaucracy. To mitigate these limitations, LinKS set up a special project structure that entailed national coordination teams with managerial responsibility for project activities in each project country. National team offices within the hosting institutions facilitated a closer collaboration with partner institutions.

A major lesson learned was that training prior to undertaking research, although important, was not sufficient. Participants often stressed the need for postworkshop follow-up, monitoring, and mentoring. LinKS tried to address this through intensive technical support throughout the research process, from research design, data collection, and analysis to interpretation and presentation. Furthermore, many researchers found analyzing socioeconomic data challenging and consequently failed to report research results in a coherent and eloquent manner, thus, pointing to the need for capacity building and developing appropriate training materials.

Research activities were closely linked to capacity building and advocacy. Government officers, researchers, and NGO staff who participated in the training and awareness workshops often developed research proposals for increasing recognition of the knowledge of men and women, documenting experiences, community-to-community exchanges, or follow-up action. All research activities explored the hypothesis that women are important custodians of knowledge in the management of biodiversity. Communication at the rural community level, conducted through participatory research processes, encouraged dialogue, feedback to communities, and follow-up action that further enhanced learning and empowerment. Research reports were shared with the local communities and stakeholders for feedback. Such feedback sessions were also important to identify follow-up action with the local communities and stakeholders to ensure that they benefited from the studies.

INNOVATIVE ACTIVITY PROFILE 2

India: Karnataka Watershed Development Project

PROJECT OBJECTIVES AND DESCRIPTION

The aim of the Karnataka Watershed Development Project (KWDP) is to improve the productive potential of selected watersheds; the steps involved include the following actions:

- Enhance production and livelihood systems.
- Strengthen community and institutional arrangements for natural resource management.
- Promote participatory involvement of primary stakeholders/beneficiaries.
- Offer assistance to women, the landless, and other vulnerable groups by supporting investments in income generation activities.

The project also aims to strengthen the capacity of communities to participate in planning, implementation, social and environmental management, and maintenance of assets. They will operate in a more socially inclusive manner within the framework of a watershed development plan implemented through community groups.

The KWDP, initiated in 2001 and scheduled to end in 2009, is being implemented in seven districts of Karnataka by the Watershed Development Department of the government of Karnataka and funded by the World Bank. The target districts are drought prone and dominated by rainfed agriculture. High soil erosion leads to declining productivity. Groundwater from existing tubewells is only for three to four months after monsoon rains. Deterioration of common lands results from poor management.

The project addresses (1) social mobilization and institution building to help plan and implement participatory watershed treatments, (2) farming system intensification and participatory research, (3) income generation activities to benefit socially vulnerable and landless groups, and (4) capacity building, monitoring, and evaluation. The project is being implemented in a phased manner: phase 1 consists of 10 subwatersheds, phase 2 covers 20 subwatersheds, and phase 3 covers the final 47 subwatersheds. The project is now working mainly on the phase 3 subwatershed.

The project uses a complex institutional structure to develop critical partnerships between government technical specialists, NGOs, communities, local authorities, and research organizations, for instance, through the formation of community-based organizations such as self-help groups (largely women and landless), area groups (mainly landowning farmers), and a community-level executive committee. Self-help groups, the basic units of planning for income generation activities, are consolidated at the microwatershed level.

What's innovative? Program design promotes greater local participation and encompasses traditional soil and water conservation as well as rural livelihood development. The gender dimension of KWDP aims at creating opportunities for vulnerable groups, including women's economic activity, access to basic resources, and participation in decision-making processes.

BENEFITS AND IMPACTS

On over 270,000 hectares, soil and water conservation improved average crop yields to between 525 and 1,136 kilograms per hectare. Crop diversity, especially cash crops, increased to four to nine crops. Groundwater availability following monsoon rains improved to four to six months.

The project established 4,300 farmer groups and 6,600 new self-help groups to sustain participatory watershed management across 7,000 communities in 742 microwatersheds.

The KWDP significantly impacts the lives of women. Visible impacts include increased self-esteem, confidence, and decision-making ability; improved livelihoods; and economic empowerment.

Annual household income increased to approximately $373. Self-help groups flourished with project support. Taking into account member savings, project revolving funds, and leveraged commercial loans, the total potential capital base in these community groups is almost $13 million, which is being used to help establish small businesses, particularly among women and the landless. The majority of members are women. More than 60 percent of the self-help groups are linked to commercial financial institutions. Moneylenders are no longer a major force in these communities.

The success of self-help groups in creating savings resulted in women's economic empowerment. Women in self-help groups better articulate their needs and plan their livelihood strategies. The majority of women feel that the project has offered several new opportunities, such as a teleconference, a satellite-based training program, and demonstrations.

Approximately 70 percent of the women and landless participating in the income-generating activity component preferred to enhance their incomes through livestock and poultry production. The project partners agreed to introduce village-based private veterinary service providers, "Gopal Mitras," to promote effective and low-cost service to people. Field visits and monitoring and evaluation data confirm the important role that the Gopal Mitras now play in many communities. All Gopal Mitras use mobile phones to make it easier for people in more distant villages to call via a community call box. Earnings by the Gopal Mitras range from $75 to $375 per month, with an average of $125.

Women's role in decision making has improved considerably at both the family and the community/institution levels. More than 70 percent of women reported that their life has changed for the better with respect to education, financial matters, marriages, and other social issues. At the institutional level, about 70 percent of women feel that their status has improved, their views are respected, and their social acceptance level has increased.

LESSONS LEARNED

The discussion below surveys some of the lessons learned from past experiences.

- Specific emphasis on women's participation in capacity building includes training programs and exposure visits. Group formation, leadership, conducting meetings, and skill development modules stress women's participation. This project strives to improve the status of women, increase their participation, and empower them to be more self-reliant and self-confident. The project facilitated women and vulnerable groups to participate and express their views freely. Thus, the project addresses community empowerment, social justice, and gender equality.
- The training provided by the project created a high level of awareness and confidence among the executive committee and self-help groups, but relatively less among the area groups. The training knowledge is utilized primarily for microcredit management and income-generating activity rather than for watershed activity. Women view access to credit as vital to their ability to earn income and to control their status and autonomy.
- Marginal and landless people are the major beneficiaries of demonstrations in the project (81 percent). However, the spread of knowledge about watersheds remains limited. People conceive of the project as more of an income-earning enterprise rather than spreading knowledge about watershed management.
- The increased financial stability through savings and employment generation (at the self-help group level) has substantially reduced people's dependency on moneylenders. The extra earnings and employment opportunities have decreased out-migration, especially in the Haveri district and, to a lesser extent, in Chitradurga, Kolar, and Tumkur. Families now experience the opportunity to live together with family members. However, long-term employment generation is yet to be realized.
- The Haveri and Kolar districts report slightly improved access to fodder and fuel, and a few districts report improved drinking water facilities. However, these issues largely depend on natural resource development and increased biomass, which require a longer period to show results.
- Reasons for the limited participation of women include the nonsupportive social environment, cultural taboos, the presence of dominant caste and politically influential members, illiteracy, and a lack of clarity of benefits.

CHALLENGES FOR WIDER APPLICABILITY

- Self-help groups should develop a sense of identity, cohesiveness, and competence in areas such as managing their finances, taking up group income-generating activities (IGAs), and involvement in community affairs. IGA products produced under the project can be branded as "KWDP" as a unified marketing label.

- Women are usually unable to participate in community activities without the consent and support of men in their families and in the community. Men, therefore, need to be more aware of the importance of the contribution of women to the project and to the development of the village.
- Women field guides can work effectively with women, and it is easier for women staff to interact with them in the community. More women field guides are needed, and they need to be trained in facilitating women's participation and technical aspects of the project.
- The involvement of women in project planning should be ensured, especially with respect to how they are treated, participation in productive work, and benefits of production. Open-house meetings at regular intervals ensure better transparency and participation.
- Women committee members must be given specific responsibilities and made signatories to the bank accounts to emphasize the importance of their role.
- Equal opportunities in employment and equal wages for men and women commensurate with the nature of work must be ensured.
- Women should be given rights over village common property land to access the resources for their livelihood, and benefit-sharing mechanisms should be developed for wider participation.
- Common property resources must meet daily household needs for fuel and fodder and provide livelihood options for women. Social fencing creates hardships for vulnerable groups. To circumvent the long gestation period for realizing the benefits, a buffer zone approach should be used to develop common property land.

NOTES

Overview

This Overview was prepared by Carolyn Sachs (Pennsylvania State University) and Marina Laudazi (Consultant), with inputs from David Boerma, Dominique Lantieri, Regina Laub, Sibyl Nelson, Andrea Rossi, and Reuben Sessa (FAO), and reviewed by Mary Hill Rojas (Consultant); Yianna Lambrou (FAO); Ilaria Firmian, Maria Hartl, and Sheila Mwanundu (IFAD); and Erick Fernandes, Robin Mearns, and Daniel Sellen (World Bank).

1. "Global Environment Outlook 4," www.unep.org.

2. Commonwealth/International Labour Organization, WTO TRIPS Agreement, Globalisation and Gender Briefs, Series 2, July, www.ilo.org/dyn/empent/docs/F1599852333/No%202%20-%20TRIPS.pdf.

3. For a full discussion on monitoring and evaluation, refer to Module 16.

Thematic Note 1

This Thematic Note was prepared by Carolyn Sachs (Pennsylvania State University) and Marina Laudazi (Consultant), with inputs from David Boerma, Dominique Lantieri, Regina Laub, Sibyl Nelson, Andrea Rossi, and Reuben Sessa (FAO), and reviewed by Mary Hill Rojas (Consultant); Yianna Lambrou (FAO); Ilaria Firmian, Maria Hartl, and Sheila Mwanundu (IFAD); and Erick Fernandes, Robin Mearns, and Daniel Sellen (World Bank).

1. "Global Environment Outlook 4," www.unep.org. The Convention on Biological Diversity defines *biodiversity* as the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes they are part of; this includes diversity within species, between species, and of ecosystems. The convention defines *sustainable use* as the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

2. Over the last few decades, agricultural development has been characterized by agricultural intensification and expansion, achieved mainly through technological advancements and the replacement of local plant or livestock varieties with improved, high-yielding, uniform varieties, as well as large-scale conversion of forests or other natural habitats to monocultural farming systems (FAO 2005).

3. *Local knowledge* is a collection of facts and relates to the entire system of concepts, beliefs, and perceptions that people hold about the world around them. This includes the way people observe and measure their surroundings, how they solve problems, and how they validate new information (FAO 2004; Warburton and Martin 1999).

4. Note that there is some contention between TRIPS and the CBD. TRIPS allows for the privatization of biological resources, but the CBD acknowledges that local communities have rights over these resources and the indigenous knowledge involved in their usage (Sahai 2003).

5. High-yielding exotic crops are often less nutritious than indigenous varieties. FAO's 1996 *State of the World's Plant Genetic Resources for Food and Agriculture* report states that the main cause of genetic erosion, reported by almost all countries, is the replacement of local varieties by improved or exotic varieties and species (FAO 2005).

6. "Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation," www.oecd.org/dataoecd/60/27/2502872.pdf.

7. Gerry Toomey, "Farmers as Researchers: The Rise of Participatory Plant Breeding," International Development Research Centre (IDRC), Ottawa, Project No. 950019, www.idrc.ca/en/ev-5559-201-1-DO_TOPIC.html.

8. In addition to the ones listed here, the legal instruments relating to biodiversity include the International Undertaking on Plant Genetic Resources adopted by FAO in the early 1980s to protect plant genetic resources; the International Treaty on Plant Genetic Resources for Food and Agriculture, which promotes conservation and sustainable use of plant genetic resources for food and agriculture; and the Global Strategy for the Management of Farm Animal Genetic Resources, which provides a technical and operational framework for assisting countries. Further information on these aspects is highlighted in Bragdon and others (2003).

9. Because of space limitations, the relevant policy instruments will not be discussed in detail here. For a discussion on these instruments from a gender-sensitive perspective, see Bragdon and others (2003); FAO (2005); Lambrou and Laub (2004).

10. For a full discussion on the intellectual property rights of indigenous and local communities, see FAO (2005); Lambrou and Laub (2006).

11. For a full discussion on these issues, see FAO (2005).

12. Cathy Rozel Farnworth and Janice Jiggins, "Gender and Participatory Plant Breeding," CGIAR, Program on Participatory Research and Gender Analysis, www.prgaprogram.org/modules/DownloadsPlus/uploads/PRGA_Publications/General/Reports/PPBMonograph4.pdf. Conventional breeding programs are recognized to have brought little benefit to some marginalized groups of farmers. However, encouraging examples can be found of projects in which women and men farmers are involved in crop improvement and breeding programs.

Thematic Note 2

This Thematic Note was prepared by Carolyn Sachs (Pennsylvania State University) and Marina Laudazi (Consultant), with inputs from David Boerma, Dominique Lantieri, Regina Laub, Sibyl Nelson, Andrea Rossi, and Reuben Sessa (FAO), and reviewed by Mary Hill Rojas (Consultant); Yianna Lambrou (FAO); Ilaria Firmian, Maria Hartl, and Sheila Mwanundu (IFAD); and Erick Fernandes, Robin Mearns, and Daniel Sellen (World Bank).

1. The IPCC is a body of the world's leading scientists convened by the United Nations. It has been established to assess scientific, technical, and socioeconomic information relevant for the understanding of climate change, its potential impacts, and options for adaptation and mitigation. The IPCC won the Nobel Peace Prize in 2007.

2. Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the twenty-first century that would very likely be larger than those observed during the twentieth century.

3. The main human-produced greenhouse gases are carbon dioxide, methane, nitrous oxide, and chloroflurocarbons. Because of space limitations, this Thematic Note will not explore the scientific basis of climate change. For information, see the IPCC's assessment reports at www.ipcc.ch.

4. This is an advance since the IPCC Third Assessment Report (2001), which concluded that "most of the observed warming over the last 50 years is *likely* to have been due to the increase in greenhouse gas concentrations."

5. See also "Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation," www.oecd.org/dataoecd/60/27/2502872.pdf.

6. In this context, climate change was brought before the UN Security Council for the first time in April 2007, as the issue was identified as one of the key factors behind the conflict in Darfur, because desertification had forced people from their homes and into areas where they competed with others for scarce resources such as water (Harvey 2007).

7. See the Overview for this Module and the Key Gender Issues section in this Note.

8. See "Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation," www.oecd.org/dataoecd/60/27/2502872.pdf.

9. FAO, IFAD, and the World Bank have provided evidence through a number of their studies and lessons learned. See also Thematic Notes 1 and 4 and Module 11.

10. Human activity has altered ecosystems so extensively that their ability to bounce back from natural disturbance has diminished considerably. For instance, deforestation impairs watersheds; raises the risk of fires, landslides, and floods; exacerbates droughts; and contributes to climate change. Destruction of coastal wetlands, dunes, and mangroves diminishes the environmental buffer system for coastal storms. All these contribute to making at-risk areas (such as low-lying islands) more vulnerable to extreme weather events (Abramovitz 2001); see also Thematic Note 4.

11. For a detailed discussion on mitigation policies aimed at reducing or avoiding greenhouse gas emissions in the areas of renewable energy and energy efficiency, see Thematic Note 3 and Module 15. The causes of global warming can be reduced either by reducing the emissions of greenhouse gases or by subtracting carbon dioxide from the atmosphere (www.fao.org/clim).

12. www.fao.org/clim/mitigation_en.htm.

13. Payments for environmental services are a market-based conservation tool in which land users are paid for the

environmental services they generate. The central principles of this approach are that those who provide environmental services should be compensated for doing so and that those who receive these services should pay for their provision (see the Overview for more details).

14. www.fonafifo.com/index.htm.

15. For examples of best practices and lessons learned relating to sustainable energy development (energy efficiency and renewable energy), see Thematic Note 3 and Module 15. For natural disaster projects, see Thematic Note 4 and Module 11.

16. For more information on this mechanism, see ftp://ftp.fao.org/agl/agll/docs/misc37 or www.climateindia.com.

17. "United Nations Framework Convention on Climate Change,"http://unfccc.int/resource/docs/convkp/conveng.pdf.

18. For a full discussion on the Clean Development Mechanism and gender issues, see Denton (2002); Lambrou and Piana (2006a).

Thematic Note 3

This Thematic Note was prepared by Carolyn Sachs (Pennsylvania State University) and Marina Laudazi (Consultant), with inputs from David Boerma, Dominique Lantieri, Regina Laub, Sibyl Nelson, Andrea Rossi, and Reuben Sessa (FAO), and reviewed by Mary Hill Rojas (Consultant); Yianna Lambrou (FAO); Ilaria Firmian, Maria Hartl, and Sheila Mwanundu (IFAD); and Erick Fernandes, Robin Mearns, and Daniel Sellen (World Bank).

1. This Thematic Note uses the following definitions: *Bioenergy:* energy produced from organic matter or biomass. Bioenergy includes all wood energy and all agroenergy resources (FAO 2006; UN-Energy 2007). *Biomass:* material of biological origin (excluding material embedded in geological formations and transformed to fossils), such as energy crops, agricultural and forestry wastes, and by-products, manure, or microbial biomass. *Biofuel:* fuel produced directly or indirectly from biomass, such as fuelwood, charcoal, bioethanol, biodiesel, biogas (methane), or biohydrogen. *Modern bioenergy:* biomass that may be burned directly, further processed into densified and dried solid fuel, or converted into liquid or gaseous fuels using so-called first- or second-generation technologies, depending on their level of development.

2. For a discussion on the plausible institutional and economic assumptions necessary for bioenergy development, see UN-Energy (2007). Projections to 2050 suggest that bioenergy sources could supply 10 to 25 percent of total energy demand (FAO 2005, 2007).

3. As a low-carbon or carbon-neutral source of energy, biofuel systems with low-energy inputs into the production process are already significantly contributing to climate change mitigation by replacing fossil fuels and through carbon sequestration in plants and soil biomass in perennial energy plantations (FAO 2006).

4. The demand for corn for ethanol in the United States doubled or tripled the price of corn in Mexico between 2006 and 2007, which led to a tortilla crisis. Poor Mexicans receive more than 40 percent of their protein from tortillas. In the United States, chicken feed costs increased 40 percent between 2006 and 2007 because of rising corn prices (Sagar and Kartha 2007).

5. The full cycle of greenhouse gas emissions of bioenergy varies widely based on land-use changes, choice of feedstock, agricultural practices, refining or conversion processes, and end-use practice. If, for example, forest is converted into sugarcane, treated with chemical fertilizers and pesticides, and refined with coal and natural gas, the resulting biofuel could have a greater impact on climate over its life cycle than fossil fuels (UN-Energy 2007). A recent study estimates that when the amount of land cleared to grow corn, sugarcane, and soybeans for fuel crops is taken into account, biofuels will have higher greenhouse gas emissions than fossil fuels (Fargione and others 2008).

6. Modern forms of energy such as electricity and petroleum-based fuels account for only a fraction of the energy use of poor rural communities. The expansion of the electricity grid is costly and often not affordable for poor communities, particularly those in sub-Saharan Africa. Electricity from renewable energy sources such as small hydro, solar, and wind energy systems also has high capital costs. See United Nations Department of Economic and Social Affairs (DESA), "Small-Scale Production and Use of Liquid Biofuels in Sub-Saharan Africa: Perspectives for Sustainable Development," Background Paper No. 2 for Commission on Sustainable Development, Fifteenth Session, www.un.org/esa/sustdev/csd/csd15/documents/csd15_bp2.pdf.

7. www.malifolkecenter.org.

Thematic Note 4

This Thematic Note was prepared by Carolyn Sachs (Pennsylvania State University) and Marina Laudazi (Consultant), with inputs from David Boerma, Dominique Lantieri, Regina Laub, Sibyl Nelson, Andrea Rossi, and Reuben Sessa (FAO), and reviewed by Mary Hill Rojas (Consultant); Yianna Lambrou (FAO); Ilaria Firmian, Maria Hartl, and Sheila Mwanundu (IFAD); and Erick Fernandes, Robin Mearns, and Daniel Sellen (World Bank).

1. Annual economic losses associated with such disasters averaged $75.5 billion in the 1960s, $138.4 billion in the 1970s, $213.9 billion in the 1980s, and $659.9 billion in the 1990s (UNDP 2004; a billion is 1,000 million).

2. The level of risk in relation to natural disasters in a society is determined by the levels of vulnerability combined with the level of probability of the occurrence of a natural hazard (flood, drought, landslide, earthquake, volcanic eruptions, storm, cyclone) as well as the level and intensity of such a hazard. See United Nations Division for the Advancement of Women (DAW), "Environmental Management and the Mitigation of Natural Disasters: A Gender Perspective," Report of the Expert Group Meeting, Ankara, Turkey, November 6–9, www.un.org/womenwatch/daw/csw/env_manage/documents/EGM-Turkey-final-report.pdf.

3. Social vulnerability to disasters is a function of human action and behavior. It describes the degree to which a socioeconomic system or physical assets are either susceptible or resilient to the impact of natural hazards and environmental changes (ibid.).

4. Whether it is a drought in Malawi (Vaughan 1987), a cyclone in Bangladesh (Ikeda 1995), or an earthquake in Mexico (Dufka 1988).

5. "Poverty and Climate Change: Reducing the Vulnerability of the Poor through Adaptation," www.oecd.org/dataoecd/60/27/2502872.pdf.

6. For a full discussion on disaster mitigation, response, and recovery, see Module 11.

7. The agencies taking part are the DPKO, FAO, IFRC, IOM, OCHA, OHCHR, UNDP, UNFPA, UNHCR, UNICEF, UNIDO, WFP, and WHO.

Thematic Note 5

This Thematic Note was prepared by Carolyn Sachs (Pennsylvania State University) and Marina Laudazi (Consultant), with inputs from David Boerma, Dominique Lantieri, Regina Laub, Sibyl Nelson, Andrea Rossi, and Reuben Sessa (FAO), and reviewed by Mary Hill Rojas (Consultant); Yianna Lambrou (FAO); Ilaria Firmian, Maria Hartl, and Sheila Mwanundu (IFAD); and Erick Fernandes, Robin Mearns, and Daniel Sellen (World Bank).

1. "Global Environment Outlook 4," www.unep.org/geo/geo4/media.

2. Ibid.

3. United Nations University, "Experts Advise World Policies to Cope with Causes, Rising Consequences of Creeping Desertification," www.inweh.unu.edu/inweh/drylands/Algiers_news_release-Final.pdf.

4. Ibid. According to the Millennium Ecosystem Assessment (2005), *drylands* include all terrestrial regions where the production of crops, forage, wood, and other ecosystem services is limited by water. Formally, the definition encompasses all lands where the climate is classified as dry subhumid, semiarid, arid, or hyperarid. This classification is based on Aridity Index values.

5. See note 56 above.

6. Ibid.

7. See Thematic Note 1 for details on the CBD.

8. "What Is Dry and Sub-humid Lands Biodiversity?" www.cbd.int/drylands/what.shtml.

9. FARM Programme, http://dbtindia.nic.in/FARM/page1.htm.

10. IFAD (2006).

11. UNDP (2007b).

12. For more on monitoring and evaluation of natural resources management projects, see the Overview. For a full discussion on monitoring and evaluation in general, see Module 16.

Innovative Activity Profile 1

This Innovative Activity Profile was written by Marina Laudazi (FAO), based largely on Lambrou and Laub (2006), and reviewed by Catherine Ragasa and Mary Hill Rojas (Consultants) and Maria Hartl (IFAD).

1. Agrobiodiversity comprises the variety and variability of animals, plants, and microorganisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry, and fisheries. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fiber, fuel, and pharmaceuticals. It also includes the diversity of nonharvested species that support production (soil microorganisms, predators, pollinators) and those in the wider environment that support agroecosystems (agricultural, pastoral, forest, and aquatic) as well as the diversity of the agroecosystems. Local knowledge and culture can therefore be considered as integral parts of agrobiodiversity, because it is the human activity of agriculture that shapes and conserves this biodiversity.

Innovative Activity Profile 2

This Innovative Activity Profile was written by Marina Laudazi (FAO), based largely on project documents, and reviewed by Catherine Ragasa and Mary Hill Rojas (Consultants) and Maria Hartl (IFAD).

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