Reconciling Ecological, Economic, and Social Imperatives

by Pattie LaCroix

Deforestation in Brazil

As we move into the 21st Century, human institutions face a variety of diverse yet interconnected ecological, economic, and social problems, ranging from threats to our planetary life-support systems to the challenges of managing rapid economic change and creating more responsive systems of governance that meet the needs and aspirations of people throughout the world.

In a recent paper prepared for IDRC, Professors John Robinson and Jon Tinker of the University of British Columbia's Sustainable Development Research Institute argue that the challenges facing humanity today cannot usefully be addressed in isolation. Their paper, entitled "Reconciling Ecological, Economic and Social Imperatives: Towards an Analytical Framework", attempts to define a common conceptual framework for the integration of ecological, economic and social objectives in policy-making.

ACHIEVING SUSTAINABLE DEVELOPMENT

Robinson and Tinker's central thesis is that to achieve sustainable development -- a concept that has generated considerable public debate -- human societies need first to achieve sustainability in each of their ecological, economic and social systems. The authors believe that while the three systems or imperatives may vary between cultures, it should be possible to adopt some common general definitions. Their paper proposes the following definitions:

- the ecological imperative is to remain within planetary bio-physical carrying capacity;
- the economic imperative is to ensure an adequate material standard of living; and
- the social imperative is to provide systems of governance and other social structures that effectively
propagate the values that people want to live by.

**INTERCONNECTED PROBLEMS**

Given this conceptual foundation, the paper goes on to discuss why all three imperatives must be satisfied, and how each of them are mutually reinforcing. "We see economic development contributing to ecological devastation all over the planet," elaborated Dr Robinson during an interview. "We see environmental degradation where the people are poor and have to scrounge for wood, because they don't have other options. Environmental degradation undercuts the land base in many traditional societies, and so one can see a link between the social, the economic and the environment."

**ECONOMIC FUNDAMENTALISM**

The authors argue that to address the problems facing our planet, social, economic and environmental imperatives must be equally weighted and valued, which will require a major shift in prevailing attitudes. "We have a tendency in our industrialized culture towards economic fundamentalism, the belief that only the economy matters and that ultimately everything is derived from your standard of living, defined in terms of the GDP per capita and other standard economic measures," says Robinson.

"We don't need to change people's values, we need to change their behaviour or their relative weighting of values. It is the institutional framework that gives rise to the expression of values that has to change," he explains.

**INTEGRATION STRATEGIES**

To integrate social, economic and environmental imperatives, the authors recommend that societies adopt complementary "dematerialization" and "resocialization" strategies. Dematerialization strategies aim to reduce the environment impact per unit of economic activity, such as policies that promote the development of more environmentally benign industrial processes. In a similar vein, resocialization strategies aim to increase human welfare per unit of economic activity, such as the introduction of shorter work weeks as a means of reducing unemployment. Robinson and Tinker point out, however, that such a shift could be socially unsustainable if it was imposed on unwilling citizens.

**DECENTRALIZATION AND GLOBALIZATION**

The authors recommend that societies implement dematerialization and resocialization strategies within an institutional framework that calls for more localized and decentralized decision-making, while recognizing the increasingly global nature of ecological and economic problems. "Our argument is that we want to get local management into the decision-making process but in order to get that, they will have to agree to common binding standards in terms of things like human rights and environmental standards," says Robinson. In this respect, decentralization and globalization are not mutually incompatible.

"We have an economic system that increasingly is not tied to sovereign nations, but is increasingly global. If we don't develop some capability to act politically in a much more global way we are going to be completely subservient to this global economic process," he says.

**DESIRABLE FUTURES**

For Robinson, the next step is to develop appropriate analytical tools for generating scenarios of possible futures, particularly desirable futures. "For a country like Canada, there may be a shorter work week, less income, less consumption, perhaps more bartering for services like child care and higher prices for goods that are environmentally destructive."
"The degree to which we are able to [achieve a sustainable future]," he concludes, "is directly linked to our capacity to capitalize on the tensions between social, ecological and economic imperatives rather than be overwhelmed by them."

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- [Robinson and Tinker on the challenges facing human institutions ...](#)
- [Robinson and Tinker on sustainable development ...](#)
- [Robinson and Tinker on priorities for future research ...](#)
- [Agenda 21 Goes Electronic](#) Better policies and reporting are expected from countries using the CD-ROM version of Agenda 21's biodiversity chapter.
- [Environment, Society, and Economy: Policies Working Together](#) Governments and institutions must address the issues surrounding the integration of environmental, social, and economic policies if development is to succeed.
- [Grassroots Indicators for Sustainable Development](#)
- [Off Course: Restoring Balance Between Canadian Society and the Environment](#)

Additional resources:

- [Canadian Institute for Environmental Law and Policy](#)
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Robinson and Tinker on the challenges facing human institutions...

The ecological challenges:

Ecologically, it is becoming clear that much of our industry, agriculture and use of renewable and non-renewable natural resources is non-sustainable. Many major fisheries have collapsed or are in rapid decline; primary forests are disappearing; fertile soils are being lost through erosion, salinization and desertification; air quality is reaching health-threatening levels in many urban areas; biodiversity, the raw material of evolutionary process and of biotechnology, is being severely depleted; human impacts on the atmosphere have, through global warming and damage to the ozone layer, started to alter one of the most basic planetary life support-systems...

The economic challenges:

Economically, we are witnessing extremely rapid change, including the nearly-complete disappearance of centrally-planned economies; powerful trends towards the use of market forces and market-based policies throughout the world; global economic integration driven by trade liberalization; and the emergence of a global capital market, characterized by financial flows that dwarf flows of traded goods and services.

Collectively, these developments have a number of effects, including:

- increased economic interdependence among nation states and reductions in national economic sovereignty;
- the emergence of global corporations and financial institutions whose activities cannot be effectively regulated by governments;
- highly mobile international trade and investment flows, which are felt to limit national freedom to raise taxes for social programs;
- increasing pressures to maintain international competitiveness;
- pressures to reduce the size of the public sector, to reduce (or at least not increase) taxation (especially direct taxes), and to reduce deficit financing and public debt;
- growing problems of structural unemployment in many industrialized countries;
- a rising and unacceptable number of people living in absolute poverty; and
- growing income disparities, both between richer and poorer countries, and between rich and poor within both industrialized and developing countries...

The social and political challenges:

Governance and other social structures are under unprecedented stress. In many market-oriented industrial societies, there is growing distrust of, alienation from and even distaste for the system of governance. This is coupled with a decreasing ability to address basic social issues such as crime, drugs, poverty, unemployment and homelessness in ways that either work or command public support. Such alienation may grow as the demand to cut taxes and reduce debt conflicts with the desire to maintain social and environmental programs. The effect is a decline in civil society and, in many inner city neighborhoods, a descent towards lawless ungovernability.

In formerly centrally-planned economies, fragile structures of governance are often barely surviving the stresses of emerging into market economies, with all the attendant social problems that accompany such
processes. In the developing world, the strains of poverty, rapid population growth and displacement, the replacement of a subsistence by a market economy and other forms of economic development, and massive environmental impacts are being managed with only mixed success, perhaps best in parts of Asia and worst in parts of Africa. And the major challenge both in many former command economies and in many developing countries, faced with a rapid decline or even collapse of traditional value-systems, may be the need to enlarge and strengthen a stable civil society which at present is only embryonic, and whose absence limits the trust and public self-confidence without which participatory governance is difficult...

Source: *Reconciling Ecological, Economic, and Social Imperatives: Towards an Analytical Framework*, by John Robinson and Jon Tinker
The most widely-accepted definition of sustainable development comes from p.8 of the [1987] Brundtland Commission [World Commission on Environment and Development] report: "Humanity has the ability to make development sustainable - to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs."

The Commission also stated:

"Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs."

Fundamental to the Commission's position were the views that sustainable development is a global issue, that poverty and environmental concerns must be addressed together, that significant improvements in the material standard of living of developing countries are a precondition to sustainable development, and that considerable opportunities exist to improve environmental quality and human development through technological development and institutional reform. In a famous and controversial proposal, the Brundtland report called for a fivefold to tenfold increase in gross world economic output to meet the development needs of the poor and to provide the wealth and technological advances required to address ecological problems.

... But serious criticism has been expressed about the principles and practice of sustainable development. These concerns stem from the rather different views of those engaged in the public debate over these issues. As the Brundtland report pointed out, any attempt to achieve sustainable development must address a number of economic issues regarding how and what is produced and consumed, and how wealth and prosperity are generated. Yet here we run into a problem. A common view of ecological values, based on a belief in strong ecological limits to growth, is that such values exist in opposition to a conflicting set of economic priorities, which drive our societies towards ever greater levels of environmentally destructive production and consumption. On this view, ecological and economic goals are locked in conflict, and each can be satisfied only at the expense of the other: more economic growth and environmental collapse, or no economic growth and economic collapse.

The contrary view, rooted in the belief that biophysical limits are either distant or subject to technological mitigation, suggests that both the aspirations of the well-off, and the needs of those living in poverty, demand continued growth in material consumption; indeed, it is argued that such growth is required if we are to pay for whatever type of environmental and social policies we want to implement.

... If we are to escape from this deadlock, we need to forge imaginative new approaches that recognize and integrate ecological, social and economic conditions and goals. For example, merely imposing ecological-based constraints on economic behavior is certain to be insufficient. Not only would such constraints continue to be resisted by powerful interests, but they represent an "end-of-the-pipe" approach to environmental concerns which treats ecological needs as an add-on, to be incorporated after the fact and only insofar as they are required. Nor do they begin to address the social or economic problems discussed above.

What is clearly preferable is the integration of environmental concerns at a deeper level, in which what is desirable for ecological reasons also is desirable economically and socially...

Source: Reconciling Ecological, Economic, and Social Imperatives: Towards an Analytical Framework, by
Robinson and Tinker on priorities for future research...

Our current state of knowledge about each of the three prime systems [ecological, economic and social] is probably insufficient to manage any of them effectively in isolation, and certainly inadequate in respect of their interactions. Scientific and other scholarly study, both theoretical and policy-oriented, is still sectorally fragmented by academic and bureaucratic boundaries, with major differences in vocabulary, concepts and unstated assumptions.

- Arguably, the most urgent research need is the development of a common analytical framework which functions equally well in all three prime systems and among their interactions: a tool or yardstick against which strategies and policies from the local to the international levels may be measured, to determine the extent to which they contribute towards the development of more sustainable societies and towards a reconciliation of the three imperatives.
- One fruitful approach may be to recognize the complex, self-organizing nature of ecological, economic and social systems, and the interactions among them. ... [This] suggests the need to develop integrated modeling and scenario analysis capability that allows us to treat each of these systems explicitly in terms of alternative development paths, rather than likely futures.

It also means that economic, ecological and social factors should be considered at the system level, not just in terms of direct impacts. Of interest are not simply the direct economic costs of various measures or effects, but their implications in terms of, say, trade or competitiveness. Social and ecological effects go beyond their direct effects in terms of, for example, job or species loss, and encompass broader community or ecosystem scale effects.

- A second dimension of more integrated analytical frameworks is the need to recognize explicitly the qualitative aspects of social and economic systems. Many assessment methods, based as they are on purely quantitative methods, are blind to such crucial issues as power, control, sense of community, trust, nationalism, cultural identity, etc...

A third suggestion is the development of approaches to analysis which are inherently interdisciplinary, which are policy-relevant, and which involve the user community not just as the audience for the published results but as partners in the design and sometimes the undertaking of the research.

- The net effect of these three suggestions would be the development of analytical frameworks based on constructing alternative scenarios that describe key interactions within and among ecological, economic and social systems.
- These suggestions pose some formidable practical, methodological and theoretical obstacles, including problems of data/information availability, problems of aggregation and integration, serious disciplinary communication problems, lack of clear conceptual frameworks and theories, and uncertain prospects for success, either analytically or in terms of policy relevance.

From one point of view these problems may seem daunting. From another, they represent a challenge that does no more than reflect the distance between what is typically done and what is needed.

Source: Reconciling Ecological, Economic, and Social Imperatives: Towards an Analytical Framework, by John Robinson and Jon Tinker
AGENDA 21 GOES ELECTRONIC

by Deborah Carter

A unique Canadian technology is making it easier for planners and policymakers to design environmental policies and monitor their impact. The Canada Centre for Remote Sensing (CCRS), in collaboration with IDRC, is developing an electronic atlas of Agenda 21, the Earth Summit's action plan.

The initiative promises to ease access for researchers and practitioners in the South to the information required to implement the Agenda 21 action plan. In its pilot phase, the atlas will focus on Agenda 21's chapter 15 on biological diversity.

The CCRS, IDRC, and several international partners have developed a prototype CD-ROM software that contains the data and information featured in chapter 15 as well as additional information on genetics, species, ecosystems, and ecosystem services. Known as the Biodiversity Volume of the ELeetronic Atlas of AgenDA 21 (ELADA 21), it is accessible to both the technical and non-technical user equipped with a personal computer and the software. Plans are under way to make the atlas available over the Internet. The software would be updated periodically with new information and country studies.

The software uses two powerful tools -- geographic information systems (GIS) and hypermedia -- to present a rich array of text, maps, tables, graphs, surveys, animations and photographic images. It includes several country studies, documentation from the International Plant and Genetic Institute, the United Nations Environmental Programme (UNEP), the World Conservation Monitoring Centre, and the Interim Secretariat for the Convention on Biological Diversity, as well as interactive scenarios linking biodiversity to socioeconomic issues.

According to John Whiting, the project's coordinator, "ELADA 21 will empower countries and agencies to report on and better manage biodiversity and related information." The atlas can be used to develop and test various scenarios and to exchange information within the South and with industrialized countries.

Among the major components of ELADA 21 are country studies from the Bahamas, Costa Rica, Canada, Kenya, Poland and Thailand. Using standardized guidelines developed by UNEP to assist countries to create national frameworks on environmental management, the countries drafted studies that provide an overview of biodiversity issues at community, regional, and national levels. Whiting says that each country was encouraged to present its own perspective and to include any traditional environmental knowledge that its citizens possess.

Marc Beaudoin, the project's leader and a staff member at CCRS, instructed country representatives on how to formulate the profiles and provided technical training for inputting text and images. For Beaudoin, the project has offered opportunities to promote technology transfer and infrastructure development. Another advantage is that participating countries that signed the Convention on Biological Diversity can present their studies as progress reports on how well they are meeting their Convention obligations.
Already, ELADA 21 has generated interest. After Costa Rica's president saw a demonstration, he used similar GIS and hypermedia tools to create a scenario for a high-level meeting on the environment. Nigerian environmental authorities asked to buy the software after seeing a demonstration of its capacities.

The ELADA 21 software becomes available early this year. At present, the main challenge confronting the project team is to find the atlas a permanent "home"; a country or an agency willing to assume responsibility for maintaining, upgrading, and updating the software.

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Viet Nam is one of many countries attempting to harmonize environmental, social, and economic policies

Among Southeast Asian nations, Viet Nam is poised to join the next wave of Asian "tigers." But the heady pace of economic growth has carried with it significant social and environmental stresses -- and this in a country where four of every five persons works in agriculture, fisheries, or forestry. Rapid industrialization of these sectors, coupled with hurried urbanization as people are forced from traditional employment in rural areas, has contributed to the degradation of the natural resources that in many ways are the foundation of Viet Nam's society and economy. Therefore, Viet Nam is now attempting to harmonize its environmental, social, and economic objectives through a national environmental action plan.

The Vietnamese experience is by no means unique. In no country of the world are there neat divisions among goals for ecological sustainability, social equity, and economic efficiency. Policies and programs targeted at each objective have impacts in more than one sector -- typically, many sectors -- at once. Nonetheless, researchers and policy makers are more likely to focus on particular problems. Although the
need for policy integration is assumed, it is often left to others to address explicitly.

**BARRIERS**

Not surprisingly, the task of integrating policy invariably faces significant barriers. Interactions among ecological, social, and economic systems create complex cause and effect relationships that are not easily unravelled. Government agencies, corporate departments, and research and academic institutes are typically set up according to discrete sectors and disciplines, each with its own interests (and interest groups), virtually assuring policy segregation. Our political economy emphasizes discounting the future value of human development, natural resources, and ecological processes in exchange for shorter-term economic development. We find ourselves short of experience in the effective application of analytical tools and decision-making processes to identify, evaluate, and manage the necessary trade-offs among objectives.

**WHAT SORT OF INTEGRATED POLICY?**

One way of confronting the problem of complexity is to define the different levels at which integration should take place, whether this is local, regional, national, or international. Another strategy is to approach policy from an ecosystem perspective, such as fluvial or watershed regions, or bio-regions based on vegetation.

There are varying degrees of integration. A sectoral policy that is sensitive to other sectoral policies or issues could be considered one degree of integration. Command and control forms of legislation that require social and/or environmental impact assessments of development projects, or "end-of-the-pipe" abatement technology applied to industrial production systems, are more advanced forms of integration. Even deeper degrees of integration involve market-based instruments, green or socially responsible procurement measures, and various types of voluntary arrangements to attempt to make environmentally and socially responsible management a priority throughout government, industry, and among citizens. Strategic environmental planning, life cycle assessment and integrated impact assessment techniques are other tools that can foster forms of deeper integration.

One case study suggests that various degrees of integration can occur incrementally along a continuum. In this case, a series of legislated impact assessments created awareness of the environmental impacts of building hydro lines on a preselected site. The "learning" that took place during the assessments and the desire to apply the new knowledge, eventually led to change within the utility, which instituted strategic environmental planning processes and self-directed assessments. In the end, new management practices were introduced that proactively assessed the impacts of alternate sites for its transmission lines.

**COORDINATION AND PARTICIPATION**

Integration of any sort requires coordination and collaboration in designing, planning, and implementing policy to establish clear objectives and divisions of responsibility. More advanced degrees of integration require more sophisticated forms of communication, decision-making, and organizational behaviour.

Mechanisms and tools such as multi-stakeholder fora and "user-friendly" information systems can provide a range of people with the means for having input into policy processes. As well as contributing to informed decision-making, the process also helps policy makers understand the socio-economic and ecological context in which they work, and all stakeholders to appreciate the trade-offs entailed in a given policy decision.

**GOVERNANCE SYSTEMS**

Whether multi-stakeholder processes and other forms of participation can be applied in developing
countries depends on specific political, social, and cultural conditions. Systems of "governance" that can anticipate societal responses to various integrative measures and accommodate the policy objectives of a range of stakeholders and sectors are crucial.

In this perspective, governance means the inter and intra-organizational arrangements, decision-making processes, incentives, and disincentives through which government and non-government actors -- including civil society, the public, communities, and the private sector -- influence decisions about societal priorities and resource allocations. It goes beyond the formal institutions of government and recognizes the significant role of non-governmental actors in policy formulation and implementation, particularly in developing countries.

INTEGRATION MODELS

One model for policy integration uses a triangle whose points represent environmental, social, and economic objectives. This approach is useful, but it subsumes political activity under the "social" category. Political activity is the main way that any society does the integration. A tetrahedral -- or three-sided pyramid -- model, where the upper point is politics, would include not only government as elected officials but also all the institutions set up by government to carry out its policies.

Despite coordination and participation strategies, efforts to balance conflicting objectives often cannot avoid some degree of conflict. Success in managing conflict lies in structuring the process so that it involves the affected parties' representatives in the design and evolution of the process itself, as well as in the negotiation of substantive issues.

Interest-based negotiation is one example of a structured, deliberate attempt to cooperatively seek an outcome that attempts to accommodate rather than compromise the interests of all concerned.

LEARNING

In structured multi-stakeholder and negotiation processes, learning is fostered through decision-making guidelines, communication rules and process steps. Learning can also be fostered even when specific structures are absent. In the case of the hydro utility discussed above, legislation, along with encouragement from management and an inter-departmental committee, prompted line departments to learn from their experiences and develop more effective integrative tools.

Learning can best be encouraged when the various parties jointly define rules for communication and negotiation, have equal access to information, create incentives for risk taking, and allow a margin for error. Other positive elements involve the delegation of responsibility and a willingness and ability to capture and build on unexpected results.

IDRC'S APPROACH TO POLICY INTEGRATION

IDRC has taken a dual approach to policy integration as a research question. One component is exploration and the other is "learning by doing." Among other things, the Centre has reviewed all projects it funds under the theme of integrating environmental, social, and economic policy (INTESEP) to identify common threads. It has supported case studies where specific information was lacking and funded workshops in different regions to learn how researchers and policy makers address policy integration.

ROLE OF RESEARCH

There is no longer any question that research can play a valuable role in a successful integration process. For example, research can identify policy options or alternative institutional mechanisms under different scenarios, and analyze their advantages and disadvantages. Research can also develop the tools and
techniques for analysis and evaluation.

Not surprisingly, the policy emphasis in integration varies by region or country. The focus in Africa tends to be on impacts of macro-level economic policies on social development, whereas in Asia the environmental implications of economic growth are paramount.

The findings also highlight challenging questions for policy integration. In what context is integration appropriate? From a governance perspective, how should integration be managed and by whom?

LESSONS LEARNED

One key conclusion drawn from the research to date is that integration hinges on the process by which the trade-offs inherent in any policy choice are evaluated and managed. Political institutions and policy-making processes need to have the flexibility to promote and foster integration when appropriate.

Ultimately, policy integration unleashes processes whose outcomes cannot be predicted at the outset. A variety of stakeholders may be relevant in any given context, which will affect both substance and process. As a result, inputs can arrive from diverse sources, leading to several possible outcomes, any of which may meet goals of equity and sustainability.

David B. Brooks and Jamie Schnurr are chief scientist and research officer, respectively, for integrating environmental, social, and economic policy (INTESEP) at IDRC. Neale MacMillan is editor-in-chief of IDRC Reports.

Integration: a skeptic's view David Brooks discusses the problems with using integration as an analytical tool for policy development.

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**Grassroots Indicators for Sustainable Development**

*by Helen Hambly*

A Kenyan farmer pulls a plant from the dry, cracked soil. Shaking away the soil, she examines the roots and predicts that the short rains will come soon, perhaps by month's end. In Bhutan, pastoralists alternate herds of yak and cattle between northern and southern pastures according to the seasonal flowering of a local shrub, a crucial practice for the regeneration of pasture and for the prevention of disease transmission between the two species. In northern Canada, aboriginal men and women discuss changes in the concentration of effluent in local rivers from pulp and paper processing. Their assessment of water quality is based on variations in the taste of fish.

All over the world, examples such as these can be found of local people using "grassroots indicators"; measures or signals of environmental quality and change formulated by individuals, households and communities, and derived from their local systems of observation, practice and indigenous knowledge. Since "the environment" is defined here in its widest sense to cross economic, social, cultural and ecological boundaries, grassroots indicators may be better gauges of well-being than traditional development indicators that are confined to sectors such as health, education or the economy. The central importance of grassroots indicators is as pieces of information that local people use to make decisions based on observed trends, or to judge how close they are to specific goals. They are instrumental in local monitoring of ecosystems, evaluating and predicting environmental change, as well as in decisions whether to work toward sustainable and equitable development.

**First Nations Environmental Indicators**

Canada's indigenous peoples, known as the First Nations, have a long, informal experience with grassroots indicators. Traditionally, they have depended upon renewable resources (agriculture, hunting and fishing) that they have managed sustainably for hundreds of years. Their livelihood and very existence has often been threatened by unsustainable development manifested in water pollution, deforestation, and declines in fish and wildlife. Now, First Nations suggest they are lacking structured, formal analysis of these environmental changes to enable communities to assess the damage done, identify their causes and slow down or reverse harmful trends.

Henry Lickers of the Mohawk Council of Akwesasne in Ontario is the lead investigator of the IDRC-supported project "First Nations Environmental Knowledge and Approaches to Natural Resources." He argues that environmental indicators can significantly improve a community's analysis and evaluation of local change. Environmental indicators can help preserve existing First Nations knowledge of sustainable resource use and, most importantly, strengthen traditional rights, including a decisive role for First Nations in formulating local resource management policies.

Interestingly, for First Nations people, indicators of environmental decline simultaneously uncover links to social violence and declining health standards. At an IDRC Grassroots Indicators Workshop, held in
Ottawa in late 1993, Henry Lickers provided a unique example of such a grassroots indicator: changes in the number of women who preserve food as a measure of domestic and social security. Women preserve fruits, vegetables, meat and fish when they feel assured of social and domestic stability. Lickers defined domestic stability in terms of lack of domestic violence and addictive behaviour as well as economic well-being.

**Indigenous Knowledge and Innovations**

The Society for Research and Initiatives for Sustainable Technologies (SRISTI), an IDRC-supported NGO in Ahmedabad, India, documents indigenous innovations and exchanges information through its network and newsletter known as "Honey Bee." This network draws its operating principles from the behaviour of the honey bee: just as the bee collects pollen without making the flower poorer, knowledge should be shared without depriving its owners. The network also encourages a cross-fertilization of ideas among innovators.

For SRISTI Chairperson Anil Gupta, environmental indicators are intrinsic to systems of indigenous knowledge and technological innovation. Local land users have rigorously explored and tested environmental indicators through generations of adaptation. The key for research in this subject area is, therefore, to compare and test Western scientific concepts against grassroots indicators to "add value" to local knowledge.

One example of how SRISTI is tackling this objective is to study the taxonomic basis of indigenous knowledge systems. Local ecological classification systems, from cloud formation to soil type, are compared to formal scientific taxonomies. This work is not only important in identifying and potentially using grassroots indicators, but also in restoring appreciation for the richness and values of local culture. Bringing this awareness to research agendas in universities, development programs, and extension services is SRISTI's next challenge.

**Moving Grassroots Indicators into the Mainstream**

Clearly, the challenge of integrating grassroots indicators into decision making is two-fold: how to make them more acceptable within current decision-making processes and how to make these processes more receptive to grassroots indicators. These twin challenges are the foundation of a special IDRC activity that supports research to evaluate the potential for identifying and utilizing grassroots indicators.

Currently, there exists little published material directly relevant to grassroots indicators. The most impressive material is "grey literature," consisting mainly of research proposals. Almost nothing exists on how grassroots indicators may actually feed into national environmental planning and policy design or reporting systems.

Given this information vacuum, two outcomes of IDRC's 1993 workshop on grassroots indicators are particularly important: the formation of the Grassroots Indicators Network (GRIN) and the drafting of a Protocol for Research and Networking Activities on Grassroots Indicators. In essence, the protocol states that research on grassroots indicators should be controlled by local communities, should address needs and priorities identified by communities themselves, and research results should first be shared with the source individual or community before any wider diffusion occurs.

In the follow-up to the workshop, two key subject areas were proposed for IDRC support: early signals of ecosystem stress or change; and community adaptation to environmental change. Already, relevant project activities have been identified. Some are specifically related to grassroots indicators, such as "Community Resource Mapping for Policy Analysis in the Central American Hillsides," a collaborative project between the Escuela Agricola Panamericana de Zamorano in Honduras and the International Food Policy Research Institute. Other projects have a sub-component on grassroots indicators, such as the Ugandan Fisheries Research Institute's "Lake Victoria and Nile Basin Management Research Project."
Beyond these two examples, IDRC, in cooperation with the Grassroots Indicators Network, is ready to support a range of activities in order to stimulate ideas and documentation on grassroots indicators as well as determine their usefulness for policy and decision making.

**Linking Grassroots Indicators to National Reporting Systems**

Certain initiatives are overcoming the obstacle of finding ways to incorporate grassroots indicators into environmental reporting systems. In Rijnmond, Netherlands, people telephone a central "hotline" number run by the Environmental Monitoring Centre to report noise and air pollution based on what they smell, see and hear. Periodic tallies of these reports are then passed on to public authorities. Data from the grassroots indicators of pollution can then be compared and synthesized with official data from the national environmental services.

Similarly, in Ontario, Canada, telephone hotlines are operated by provincial authorities, often with the participation of community groups, for monitoring invading plant species and sightings of endangered birds and animals. Use of local observations means that decision makers have an additional source of data, including an increase in sample size due to a larger number of direct observations.

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