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DILEMMAS OF BUILDING A SUSTAINABLE, EQUITABLE INFORMATION RESOURCE

by

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Because information plays a central role in environmental and CPR research, the quality, flow, and timeliness of intellectual resources are crucial. The development agency community repeatedly stresses the intricate relationship between information access and economic development (UNDP, 1997; Mchombu, 1996; McConnell, 1996; Baranshamaje, 1995; Valantin, 1996). International information specialists write about the urgent need for local, *appropriate* information in locally-designed libraries which better serve local, indigenous communities (Alemna, 1996; Matare, 1997; Kuntze, 1996; Ifidon, 1990). Better accountability and communication of scientific information by researchers[1] is also being voiced more frequently. In his keynote address at the 1996 IASCP conference, Marshall Murphree called for colleagues to take on the responsibility to actively share their knowledge and insights with communities and policymakers outside the academic arena "who can use them to make a real difference" (Murphree 1996, 2). Neal Lane, Director of the National Science Foundation, urges researchers to become "civic scientists" by reaching out to the public and engaging in "genuine public dialogue with their local communities" (Lane, 1997).

In this paper I examine some of the perplexing problems facing scholarly information as an essential and fundamental resource. My intention is to bring stronger attention to the changing nature of academic information, and the need to design new institutions for the access and distribution of environmental and CPR information. Examples are drawn from my research on academic libraries in Uganda and the U.S.[2] While the dilemmas of managing an exponentially growing resource are on a global scale, strategies for better information management, like natural resources, must be designed at the local level.

It is helpful to think of this collaborative information resource as a growing intellectual commons. Although information is often cited as a prime example of a public good (Ostrom & Ostrom, 1977), the *artifacts* of knowledge and information—the databases, books, articles, maps, videos, graphics, both hard copy and electronic—can be privately or communally owned. Property rights and boundary lines can be clearly drawn around books and journals in a university library, for instance. The library purchases the items, puts its stamp on them, labels them with a call number, puts them in their assigned place and decides who may use them and for how long. The author and/or the publisher owns the copyright and the original manuscript, but copies are often sold and

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[1]"Researchers" refers to include all who are involved in the pursuit of scientific knowledge—educators, practitioners, policymakers, students, and so forth.

[2] The observation of Ugandan libraries were made during a three-week visit to Makerere University in September 1997.

dispersed throughout a wide geographical region. With the electronic amassing of information on the World Wide Web, however, ownership and boundaries of information are much more difficult to assign or determine. Whereas information specialists traditionally sought to *amass* sizeable collections which the libraries would own, they are now challenged with the goal to both *identify* and *glean* relevant, quality electronic information from a mountain of data refuse. The former method ("collection development") of building a resource of scholarly artifacts required ownership; the latter ("access") can be accomplished through cooperative arrangements among other libraries and information providers.

When information units are common pool resources (CPRs) there are serious problems of scarcity, inequity and exclusion. This paper raises some fundamental issues about the flow of environmental and CPR information: what are its boundaries, who has access, how is it distributed, who is responsible for it. The primary dilemmas addressed here are: (1) the interdisciplinary nature of the information; (2) the collection and provision of local information for a local user community; (3) the selection of important information and its provision to a wider, regional and global community; and (4) the need for collaborative and reciprocal arrangements which take on the responsibility for this information.

Historically, researchers have relied on editors, publishers and librarians to systematic evaluate, collect, manage, and distribute or make available scholarly information. Because of changes in the nature of information, technology, the global importance, and the scope of the dialogue it is time to re-examine our dependency on this expensive, time-consuming, elitist/exclusive method of managing this information resource. Successful strategies for improved information resources require a new understanding of the role they play and the active participation of each researcher in the management of this commons.

The "headenders" (Northern researchers) have widespread access to well-stocked libraries and computer technology, enabling them to access the most timely international scientific data. The "tailenders" (Southern/LDC researchers), who have the same information needs, must make do with poorly-stocked libraries and rudimentary technology. In some regions, libraries and information resources have been depleted because of wars, environmental catastrophes, poverty, and lack of security. Because of an across-the-board lack of knowledge about the scope, diversity, and content of CPR research among information professionals, libraries also suffer from "information pollution"—low quality, inaccurate, obscure, inappropriate, or out-of-date information. The imbalance of scientific information, which is overwhelmingly Northern, produces another type of information scarcity: a lack of indigenous environmental information from the South.

The International Association for the Study of Common Property (IASCP) has more than 1800 individual and institutional members in 61 countries who are pivotal in the task of improving the quality and availability of CPR information. Members are joined together in an association whose mission is "devoted to understanding and improving institutions for the management of environmental resources that are (or could be) held or used collectively by communities in developing or developed countries." Also relevant are the goals of the association:

To encourage exchange of knowledge among diverse disciplines, areas, and resource types
To foster mutual exchange of scholarship and practical experience
To promote appropriate institutional design[3]

In this context, this paper relates directly to the mission and goals of the association which have much to do with the importance of intellectual exchange. If we focus our ultimate attention on the information dilemmas which exist within this relatively small organization, we gain a local perspective and a more manageable resource. Our assignment has a familiar ring: we need to seek innovative ways to make rules and design institutions to sustain our scholarly information resource.

Examination of these dilemmas starts with a comparative assessment of CPR and environmental resources at a large U.S. university—Indiana University (IU)—and one of the oldest African universities—Makerere University in Kampala, Uganda. The study grew out of practical concerns of information access for collaborating researchers participating in the International Forestry Resources and Institutions (IFRI) project[4] centered at an IU institute, the Workshop in Political Theory and Policy Analysis. The collaborating researchers normally train at the Workshop for at least 1 year. During their stay they have access to an excellent university library system, a specialized CPR library, interlibrary loan, the Internet and electronic information, and state-of-the-art computer technology. Their course of study includes seminars, coursework, theoretical training, and fieldwork, as well as bibliographical and computer instruction. When they return to their home institutes, however, the researchers are excluded from much of the global information resources because of inadequate libraries and technology. As a librarian and information provider, the question of inequitable resources and the insufficient flow of information became a crucial one for me.

Most often the lack of adequate libraries and research materials in developing countries is attributed to elements such as poverty, political chaos, poor communications infrastructure, etc. These external factors are used to explain the helplessness, dependency, and stagnation of university libraries in developing countries. At the same time, academic libraries in the North are having problems of their own, trying to adjust to ever-increasing change in the information arena. Both rich and poor libraries need to seek new and innovative ways of information collection, access and provision.

The Well-stocked Resource (The Large U.S. Academic Library)
The primary mission of academic libraries is to support the educational missions of the universities they serve. Traditionally they accomplished this by collecting, organizing, preserving,

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[3]The mission and goals are available on the IASCP homepage at:
http://www.indiana.edu/~iascp/brochure.html

[4]A center in the MUK Forestry Department is one of several IFRI Collaborating Research Centers which are located in Africa, South America, and south Asia.

and storing collections of books, serials, and multi-media materials. The libraries, thereby, have been considered the storehouses of the scholarly record of civilization.

Library systems of collection development were structured upon the university schools and departments. Budgets were allocated by academic disciplines and subjects. The materials were classified and shelved by a strict subject arrangement[5]. Librarians ("subject bibliographers") drafted collection development policies which outlined the parameters of each subject collection. Until the late 1970s, the strongest collections were to contain "all" quality publications in multiple languages, in order to fully serve present users and to fulfill predicted future need.

About 20 years ago, however, two major changes occurred at the same time: prices, particularly of journals, rose dramatically requiring the cancellation of many subscriptions and the cutting back of book purchases; and computer technology took on an essential role in the library. For the next 15 years, libraries dedicated themselves to the computerization of information. The focus for academic libraries shifted from building collections to providing access. Enabled by local and national computerized catalogs, libraries cooperatively developed a system of resource sharing: Interlibrary loan (ILL). With ILL, libraries could borrow books or order photocopies of articles upon user demand. The remote access of library materials which ILL provided offered an alternative type of resource. While collections were very subtractable with usually only single copies of books and journals, ILL created a much larger and much less subtractive resource.

The development of the World Wide Web in 1992 provided another type of information resource: Electronic data and information with color, graphic images, sound and video. What at first was a chaotic assembly of random information bits has, by 1998, become the center of intellectual exchange—with interactive conferences, real-time reporting, collaborative scientific laboratories, searchable databases, full-text books and journals, working papers, research reports, group discussions and one-to-one correspondence. While online electronic information contains numerous problems such as variable quality, questionable accuracy, lack of standards, and limited search engines, access to the Internet is now considered essential by the global academic community. The ability of each person with a computer to electronically self-publish virtually unlimited amounts of information has most dramatically changed the rules of the game.

The traditional university library as the definitive storehouse of the scholarly record is no longer a viable option, or even a possibility, except, perhaps, with a rare books library (which may still have claim to limited collections that are "complete"). Because university libraries in North America have striven to maintain basic "core" collections in all subjects, these libraries are essentially building the same collections, all of them limited in scope by the limited funds available to them.[6] Decreasing funds for in-house collection building has also adversely affected inter-library loan. Hard copy books and journals continue to fulfill certain needs, and demand for

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[5]Usually either the Library of Congress Classification System or the Dewey Decimal System.

[6]See Reed-Scott (1996: 61+) for an interesting discussion of the current collecting patterns of North American research libraries.

remote access and photocopies through ILL continues to rise. More space, more time, and more money, however, are being designated to give users better access to the Internet with its unknown quantity and unknown quality of remote resources.

The Condition of African Libraries

The condition of most African libraries is quite antithetical to the academic libraries in the North. The Makerere University (MUK) library system is in better condition than most of its African counterparts, but it will amply illustrate the differences in structure, resources, and services. Like most African libraries, the MUK library is still structured on the colonial system of librarianship (Alemna, 1996). The library system contains a main library and several departmental libraries. Only a few of the smallest libraries have computerized catalogs. The Dewey Decimal System (DDS) is used for classification which is often insufficient or inappropriate for indigenous information (ibid.: 5). The books and journals' collections are small and out-of-date. The more recent items and those most in demand are kept in locked, caged areas with limited access, often only to faculty members of the corresponding disciplines. There are usually no university funds to build the library collection. The library is almost completely dependent on development agencies, grants and exchanges. The resulting collections are haphazard rather than intentional, with a plethora of non-African publications. Because of the scarcity of resources, security of the collection is a primary concern. The primary mission often becomes the *preservation* (rather than the *circulation*) of the valuable resources that they do have.

The MUK libraries are well-used, often crowded, and clearly at the center of academic life. The librarians are short-staffed and frustrated by primitive systems which are insufficient to meet the needs of the users. There are a number of journal index databases available on CD-Rom, but it often is slow and expensive to obtain the full-text of articles found in these database citations. Most of the libraries do have limited Internet connectivity but the service is extremely slow, using 9600-baud modems. In September 1997 there were only 5 online computers for 15,000 main library users. Clearly, the major obstacles are the lack of technology infrastructure, the cost to use a commercial Internet service (about $50/month per connection), the lack of technological expertise, and the general lack of economic resources for hardware and software.

If we examine the African and U.S. libraries (MUK and IU) in terms of the diverse informational needs for environmental research as well as [6]the interdisciplinary needs of CPR research, however, we find that both systems are deficient in providing and accessing adequate resources. Neither system has in place adequate methods of collecting and providing *local* information, such as ongoing research reports and conference papers which are often on the cutting edge of their disciplines. These are possibly the very information resources which are most essential for these institutions to be collecting, storing, and redistributing to the global arena.

Issue 1: The Challenge of Interdisciplinarity

There are 543 papers in the archives[7] from the first six conferences (1990-1996) of the International Association for the Study of Common Property (IASCP). A sampling reveals that 136 of the papers are on fisheries, 116 on forestry, 31 on grazing. There are 73 papers that deal with African resources, 14 with South American. 185 papers apply an economic analysis, 122 discuss property rights, 41 address Hardin and the tragedy question. Indigenous knowledge systems are the focus of 84 papers, and more than 300 discuss the importance of participatory management and local control of the resources. The papers comprise contributions from anthropologists, political scientists, resource practitioners, policymakers, legal scholars, economists and other disciplines. These subjects, fields, disciplines, and viewpoints exemplify the complex and multilayered nature of this area of study: common pool and common property resources (CPRs).

Environmental and CPR research is often a collaborative process between researchers who cross geographical, cultural, resource, and discipline boundaries to learn from different knowledge systems. Clearly, from an information specialist's perspective, the knowledge and information required for successful scholarship in this kind of research goes beyond or falls outside of the usual ways of dividing knowledge by subjects. But it is by subjects that library collections (north and south) are still being built.

The interdisciplinary approach of CPR research, which combines both theoretical and empirical research, is well illustrated by the Institutional Analysis and Development (IAD)[8] framework[9]. Simply explained, the framework examines outcomes (such as sustainability or depletion) of a resource (such as a forest) by studying the physical characteristics (number, size, types of trees and plants, soils, climate, wildlife, etc.), the social characteristics (the community(s), number, types of users, etc.) and the managerial characteristics (the types of operational, collective choice and constitutional rules). Subject materials which support various aspects of this kind of analysis overlap considerably, but examples are: Studying the physical characteristics can require satellite images, GIS technologies, and maps as well as the subjects of biology, botany, geography, agriculture; studying the community of users may call for works in anthropology, demography, sociology, etc. Understanding rules-in-use requires support materials in economics, political science, law, etc.

Understanding this implicit, interdisciplinary nature of CPR and environmental research helps clarify the nature of the information resource to be collected or shared. Certainly, it

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[7]The IASCP archives are housed in the Workshop Research Library, Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, Indiana, USA.

[8]A variation of this framework is the "Oakerson Framework" which is applied in several case studies in Bromley (1992) and elsewhere.

[9]See Kiser and Ostrom, 1982; Ostrom, 1991; Tang, 1992; and Ostrom, Gardner, and Walker, 1994).

demonstrates that the traditional boundaries of subject classification are hindrances rather than tools in making order of this knowledge. The IASCP conference paper archives reveal the richness of this pooled knowledge. An African farmer association seeking to influence new policies may find a rich source of information from the co-management studies on North American fisheries. Studies on customary law in India may be applicable to property rights issues of the Norwegian Saami. Experimental economics and game theory provide tools in the prediction of decision-making behaviors. Remote sensing technologies can assist in making changes in forest management.

The interdisciplinary nature of CPR research is especially problematic for libraries dependent on foreign aid. The MUK Forestry Library, for example, can more easily acquire funds to purchase forestry texts and subject-related CD-Roms, such as TREE-CD than to purchase theoretical texts on decision making, property rights, or institutional analysis. IASCP participants perhaps best understand the relevance and importance of these different approaches and disciplines. The wide breadth of CPR knowledge and understanding needs to be more actively circulated among IASCP members, and more effectively collected and distributed to a larger sphere.

Issue 2: Designing Local Information Systems
Libraries are artifacts that need to be intentionally crafted to meet the needs of the local community. Yet, academic libraries everywhere lack adequate linkage systems with their users. The library staff is often out of touch with the current research of the faculty and students, and those researchers have not traditionally deposited their unpublished work in their local libraries. But while researchers are still publishing in peer-reviewed journals and books, they are also bypassing the standard publication route through the more timely, more direct and cheaper medium of the Internet. In today's electronic environment, massive amounts of scientific data—green papers, databases, research notes, discussions, statistics, case studies, newsletters, proposals—are of enormous importance but never will be published. The electronic exchange of information is much more rapid, timely, direct, and, ultimately, cheaper. This kind of information not only reflects the *products* of scholarly research but the *process* as well. In environmental research, the process documentation can be the most revealing and the most elusive.

Both rich and poor libraries are based on antiquated systems of building and managing collections. With the global availability of information through the Internet and interlibrary loan it is time to re-examine what information is essential for the local community of users. Is published information still the primary resource? Does a subscription to *Land Economics* have more value to CPR researchers than the recent papers of a conference on property rights?

In the globalized environment, linked by the Internet, libraries can begin to better focus on local needs and local resources. In resource-rich information environments more attention needs to be paid to ongoing interests and research—links to local research, outreach instruction to researchers on the archiving of their materials, and education about standards for electronic information.

Where computer technology is still scarce, there is much to be done. In an examination of information resources on forestry in the Kampala region of Uganda, I found that the forestry

researchers' needs were thwarted by several factors: a lack of published materials[10], a lack of awareness of relevant materials in other local libraries, limited access to libraries and collections outside of their interests (forestry and agriculture), as well as inadequate computer technology, limited hours, and little bibliographic assistance.

The need for better technology and funding is apparent, but immediate steps can be taken when information managers open the lines of communication, visit other libraries, and begin sharing collections. A larger, more useful information resource can be created by combining many limited ones together. Library catalogs can be designed to record not only items in a particular building but also relevant items in other libraries, institutes, offices, and departments. They can refer the user to department archives, field studies, information about local indigenous communities, local languages, etc. This does not require new buildings or grand sums of money. Rather, it requires interested individuals identifying information of value and making that information available to the local community through communication, paper catalogs or computer databases. Such an endeavor of local resource sharing requires communication, a process of information gathering, improved methods of monitoring and sanctioning and new levels of trust. Eventually electronic connectivity may assist in the distribution of the shared resource(s) both among local resource users and international colleagues. Active information provision also builds powerful self-governing behaviors and recognizes the value of local information in advancing local cultures.

Especially in less-developed regions such as Africa, it is crucial for librarians and information specialists to seek innovative ways to re-mold libraries into appropriate local institutions. There are independent strategies that can break the bonds of external funding and foreign collections.[11]

Issue 3: The Provision of Local Information to the Global Community
The Internet has dramatically changed the provision and distribution process of information. With published information, the market generally determined its provision and distribution. Publishers evaluate and distribute materials to vendors and booksellers; individuals (or libraries) who can pay the price, buy them. The Internet, on the other hand, has put a printing press and a global audience in the hands of millions of researchers. Intellectual exchange has suddenly become faster, cheaper, and geographically wider.

Electronic information can play a powerful role in correcting serious information inequities: the lack of access to information in the South, and the general scarcity of Southern research literature

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[10] The bulk of current publications in the Forestry Department Library were multiple copies (between 10-50) of textbooks for teaching and fieldwork.

[11] Vincent Ostrom has continually emphasized the importance of local, self-governing institutions. In a recent work, he writes: *The worst tragedy that might afflict the African peoples would be to presume that ordinary people are incapable of coping with the conditions of life on the African continent and to accept a dependency on those from the "North" who come bearing money, arms, and modern technologies* (V. Ostrom, 1997: 249).

in the North.[12] Web sites, such as the IASCP homepage[13], can function both as a library and a publisher/distributor for its primary community of association members. By linking and electronically publishing working papers, the association adds value to the global pool. It also becomes more visibly the central forum for the study and research on common pool resources. Employing this organization to disseminate CPR information is a self-governing mechanism of moving beyond geographical, economic, and technological constraints.

A successful model of an alternative method of provision and distribution of scholarly information is the Web site at the Los Alamos National Laboratory in New Mexico[14]. This electronic site serves as the main repository of working papers or pre-prints in the field of physics. The homepage is used by 35,000 people a day to submit papers or critiques of other papers, or to browse or read the papers online (Hafner, 1998: B12).

Some have expressed concern that electronic distribution of papers on an international scale contradicts the established process of peer review. This is a highly contested area of debate. But even as the debate rages, more and more quality research information is being distributed electronically. This trend is building a culture around the benefits of fast, cheap, wide-range intellectual exchange.

Web-based peer review is a growing phenomenon that is an alternative, potentially commercial-free method of adding intellectual value to the research pool. While fields such as physics, economics, electrical engineering, and information science have already established systems and cultures or rapid information exchange, others, such as sociology, psychology, and chemistry still rely more on paper (or electronic versions of paper) journals which continue to be commercially published and peer reviewed (Kling and McKim, 1998).

Local, individual efforts to improve the provision of information to a wider sphere take control of "capacity building" initiatives of development agencies that all too often assert their own agenda for filling local needs. Numerous project descriptions and reports of the World Bank and the UNDP, for instance, emphasize the improvement of electronic connectivity and information access as essential to promoting economic development. The emphasis on access alone, however, furthers the imbalance of resources and underscores the dependency on the Northern literature. One-sided access initiatives also overlook the crucial importance of Southern, indigenous information to the global information pool.

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[12] A 1995 survey revealed that the main index of scientific journals, the *Science Citation Index*, indexes 3,300 journals of the 70,000 that are published worldwide. Less than 2% of the journals are from developing countries. The number of Third World journals, in fact, declined from 10 in 1981 to 53 in 1993 (Gibbs, 1995).

[13] The Uniform Resource Locator (URL) is: http://www.indiana.edu/~iascp

[14] URL: http://xxx.lanl.gov

Issue 4: The Role of Networking
The previous issues deal with dilemmas of provision and access of the information content. The process of networking is about building relationships within a community: researcher to researcher, practitioner, policymaker, educator, information manager, and combinations thereof. Networking builds the capacity of getting the right information to the right people at the right time. The possibilities for knowledge-sharing far exceed electronic search engines and library management systems.

The improvement of information access and provision is not just about connectivity and technology. It is as much about the awareness of how crucial timely and accurate information is—for good policy and decision making, agriculture and natural resource management, health care, education and economic development. Greater and greater numbers of people in the world have become aware of the connection between successful decision making and timely and accurate information. Just recognizing that the helpful, expert information is out there and available is a relatively new way of thinking. The corollary to this new awareness is the realization that there are many areas—especially in resource management—where you are the expert. Thus, we begin to better understand our interdependence upon each other for our areas of expertise.

We are challenged to find better mechanisms to carry on the dialogue which arises at these conferences. It is possible that the *CPR Digest* can be utilized to involve the input of more of the members. Focus interest discussion groups, such as Commons, Fishfolk, and PRCA can provide forums for those with easy e-mail connections. An e-mail network among East African environmental researchers was constructed in 1997 for the purpose of exchanging timely information about ongoing research in order to stop "reinventing the wheel."

Conclusion
Information is perhaps our most important resource for policy and decision making, natural resource management, local identity and autonomy, and improved economic welfare. Understanding the interdisciplinary nature of CPR research and knowledge is crucial in the collection and management of the information. The growing global access to information can relieve the inappropriateness of outmoded or colonial library systems. Networking is a place where every individual researcher can enter the intellectual exchange and continue to contribute to the design of the CPR information resource.

The decisive element in the improvement of the flow of the CPR knowledge is the voluntary, intentional, systematic provision and distribution of local information to the local, regional, national and international levels. Improving the identification and awareness of local information needs, the institution of resource sharing systems between libraries, alternative methods of collecting and organizing information, and lines of communication begin to address the problem of inequity.

Successful management of our information resource will require informal systems of reciprocity, collaboration, and self-governance. Extending the concept of reciprocity to information goes beyond *quid pro quo* and "tit for tat" rules of formal exchanges. Reciprocal exchanges are

undertaken with the expectation that in contributing to the welfare of others, others will do likewise (Oakerson, 1978: 34-35, 1993: 147). It carries with it presuppositions of trust and social responsibility. Whether on the local or the global level, resource sharing and collaboration are also key ingredients to building a high quality information base. The transaction costs are much more the energy and time rather than travel and money (Axinn & Axinn, 1997: 23). IASCP as an organization can serve as the center for the collection, management and distribution of the CPR intellectual commons. Each member is a user and provider in this commons and has a powerful role to play in the collection, use, and provision of this resource.

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