CBNRM Net: From Managing Natural Resources to Managing Ecosystems, Knowledge and People

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Abstract*. Environmental online communication epitomises the opportunities offered by information and communication technologies in managing the changes brought about because of globalization of environmental and developmental concerns, and the increased integration of environmental issues with socio-political concerns of development. Taking the Community-Based Natural Resource Management Network (CBNRM Net) as a case study, this chapter argues how environmental online communication could look beyond an emphasis on information to focussing on knowledge, and to management of such knowledge that can be instrumental in achieving the goals of more equitable and sustainable natural resource management. An assessment of the present and future role and scope of environmental online communication in development cooperation, and in community-based natural resource management in particular, is provided.*

1 Introduction

Our interest in Environmental Online Communication (EOC) is connected with our work in development cooperation. We are optimistic about the potential role that EOC can play in addressing the issues and remedying the problems we are seeing, specifically as related to poverty reduction and to sustainable management of natural resources. The paper aims to assess the usefulness and limitations of EOC.

The term as such may be new, but it comprises established concepts. Initially, we understand EOC to be communication about the environment using the Internet, specifically the World Wide Web (Web). We conclude by suggesting a broader understanding of the term as it applies to the area of Natural Resource Management (NRM) and Community-Based Natural Resource Management (CBNRM), as these terms are used within development cooperation. EOC is discussed in the context of networks.

The structure of the chapter is: Section 2 presents a broad context for understanding and assessing EOC. Section 3 addresses development cooperation. Section 4 is a case study of an EOC application, namely the Community-Based Natural Resource Management Network (CBNRM Net). In Section 5, evidence from related networks are presented. Section 6 analyses EOC as found within CBNRM Net and other networks. Finally, Section 7 contains our conclusions.

2 The Context

EOC represents the bringing together of four lines of development: (1) globalization, that makes possible the lines of development and social change given below, and also integrates them, (2) environmental issues brought on to the center stage, and the integration of social and ecological issues, (3) a growing focus on communication, in both its intra- and inter-cultural aspects and (4) the seemingly endless possibilities represented by information and communication technologies (ICTs).

2.1 Globalization

Globalization is understood to represent the many unfolding processes that, taken together, cause an accelerating pace of social transformation as well as innovation. In this sense it represents the context for the three other lines of development.

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Globalization is not either positive or negative (Castells 1999). It has negative implications while also representing possibilities for change, for innovation and for betterment in livelihoods. One important positive effect is the increasing focus at the local level, that is, *localization* (World Bank 2000a). Taken together, localization and globalization are responsible for the growing interconnectedness and interdependence in the contemporary world. ICTs are the most visible expression of these seemingly converging processes, as well as the vehicle that makes it possible (Servaes 2002). Another positive outcome is the increasing focus on global commons that has led to a concern with public policy and a call for global public policy. This is of particular interest as viewed from the vantage point of EOC.

2.2 The Environment

The environment began to be addressed as early as the 1970s. At the 1992 Earth Summit emphasis was placed on understanding the environment in *context*. Governments committed to an idea with profound implications for sustainable development: Every person should have access to information about the environment, opportunities to participate in decision-making processes affecting the environment, and access to redress and remedy. Articulated in Principle 10 of the Rio Declaration, these 'access principles' represent fundamental global norms of equitable and environmentally sound decision-making (Petkova and Maurer 2002).

EOC, concerned with facilitating access to information and knowledge and with participation, can provide the pivot for reaching these goals. Environment is no longer considered for its own sake, but is mainstreamed in poverty reduction strategies (see Section 2.5). This adds to the significance of EOC in multi-stakeholder dialogues, and to the communicative aspect of such consultations.

2.3 Communication

Communication is here understood as "the creation of shared understanding through interaction among two or more actors" (Ostwald 1995). Communication is essentially a relationship *between people*. Traditionally communication was direct, and took place between individuals who knew each other and were similar in most respects. The medium of communication was mostly oral, and the content was complex. Modern communication is also complex, but in different ways. It takes place between many more stakeholders, often located at different societal levels (Long 2000). The medium of communication is largely written and in electronic form. Modern-day communication is often asymmetrical, the content is often instrumental, and it increasingly contains information without a contextual frame of reference. The interpretation and use of information – as knowledge – is becoming a separate and less prioritized exercise (Soeftestad 2001a).

Communication in the context of development cooperation is understood as a discourse between stakeholders over what development is, with the – in some cases – realized outcome of arriving at an agreed upon definition (Nustad 2000). It is useful to remind us that communication is a potential and not a solution. Thus it becomes important to address how communication is changing, why this is problematic, and what can be done about it (Domatob, Ausmus and Butler 1996).

2.4 Information and Communication Technologies

ICTs in the context of development cooperation comprise:

- *Broadcasting and publishing.* Including newspapers, radio (analog and digital) and television.
- *Computing capacity*.
- *The Internet*. Including chat, e-mail, mailing lists, newsgroups, FTP, video conferencing, the Web, Web conferencing and Web-to-mail.
- *Telecommunications*. Including mobile phones, satellite communication and telephones.

The Internet is the backbone of global computer-mediated communication (Castells 2000). Here EOC is taken to be partly a subset of computer-mediated communication, and partly a broader concept and idea, as it focuses mostly on what flows between users, rather than the actual hardware. ICTs hold great potential for helping developing countries and countries in transition. The key reasons for this are because they can provide low cost and accessible means for people to communicate with each other. Exactly how to do this is, however, an open question. While ICTs hold great potential they also represent countless possibilities for mistakes (Curtain 2003).

The cultural, historical and technological contexts for the invention and development of ICTs are complex. Some are still under development while others appear to have found their niche or are lagging behind. This is, perhaps, less a question of lack of innovative potentials than of innovative incentives. Technological innovation today is mostly a question of economics and profit. The emphasis is on the 'new' ICTs, which in many cases do not fit well with the situation at the local level in developing countries and countries in transition.

2.5 Implications and Visions

The differences between the haves and the have-nots are widening and poverty is growing. Various analyses refer this situation back to different factors, but many seem to agree on differences in power – whether cultural, economic or political – between different population segments in any one country, and between countries. The old adage that 'knowledge is power' is brought to bear on the analysis, and it is argued that ICTs can help leverage the situation for disadvantaged poor by delivering the right knowledge at their doorsteps at the right time (Soeftestad 2001a).

The fundamental question that arises in applying ICTs to developmental cooperation – specifically to poverty reduction strategies – is how to understand and assess ICTs within the overlapping contexts of globalization, the environment, socio-cultural-political contexts and communication (Gerster and Zimmermann 2003)?

3 Development Cooperation

Development cooperation is a reflection of the above lines of development. In this section, two of them are given special attention.

3.1 Knowledge Management and Communication

To understand the concept of knowledge management (KM), it is important to realize the meaning ascribed to the term 'knowledge'. 'Information' is data arranged in meaningful patterns, whereas 'knowledge' is something that is believed and is true (Soeftestad 2001a). In a similar vein Lloyd-Laney (2003:4) argues that "knowledge is the sense that people make of information". Barring the implications of recent discussions over the concepts of truth, reliability and cultural relativism, the distinction holds, perhaps with the added provision that knowledge is contextual and broad, and often needs translation and interpretation. Information and knowledge is shared or transmitted through the process of communication. It is important to keep in mind that while it is unproblematic to communicate information, it is often difficult to communicate knowledge. KM is here understood as a broad and applied context for development cooperation, inter-cultural communication and ICTs (Gibbons 1994; Richardson 2001; Soeftestad 2001b, 2002; World Bank 2000b). Furthermore, we understand 'knowledge' to cover Traditional Knowledge (TK), Indigenous Knowledge (IK) and modern knowledge systems, as occurring within their respective cultural and scientific paradigms.

KM is often misunderstood, in fact, so much so that a list of the "deadliest sins" of KM have been compiled (Fahey and Prusak 1998), including the following: (1) emphasising knowledge stock over knowledge flow, (2) failing to see that managing knowledge must also be about creating contexts for sharing, (3) not heeding the role and importance of tacit knowledge and (4) separating knowledge from its uses.

There are three dimensions to KM: (1) sharing knowledge, (2) the reach of ICTs, which gives a new dimension to sharing knowledge and (3) explicating knowledge, i.e., capturing, organizing and disseminating it. Likewise, key dimensions of KM programs involve decisions about: (1) with whom to share, (2) what to share, (3) how to share and (4) deciding to share. The decision to share is especially important. It involves four further 'how to' questions (World Bank 2000b):

- *Connecting versus collecting.* Connecting refers to linking people who need to know with those who know. Collecting refers to capturing and disseminating knowledge through ICTs, aimed at codification, storage and retrieval.
- *Creating social processes within which knowledge sharing occurs.* Networks that connect relevant stakeholders are a key building block.
- *The use of alliances and partnerships.* Alliances and partnerships are fundamental to achieve agreed-upon goals.
- *Choice of ICTs.* The Internet, specifically the Web, is a key factor in catalyzing KM. But there are problems with relying too heavily on the Web.

Closely connected with dissemination of knowledge is the concept of *knowledge networking*. Here, knowledge is not passively disseminated but actively shared, typically with likeminded organizations, networks and individuals.

Communication as understood here is identical with *development communication* as this term emerged in the 1950s onwards. It refers to the application of communication strategies and principles in development cooperation. As such, development communication has, from the beginning, been a reflection of the dominant theoretical paradigms in development cooperation. The dominant communication paradigm has been behaviour change models with their attendant emphasis on, for example, modernization and diffusion of innovations. The other broad approach is participatory models and approaches (Feek and Morry 2003; Waisbord 2001). We find that the latter most closely agrees with the reality as we see it.

3.2 ICTs, Social Change, and Equity

There is today an intense focus on the potential role of ICTs to bring about sustainable livelihoods and to reduce poverty. This potential has, so far, not been realized, partly because of little access to knowledge, and partly because access to the technologies themselves is too limited for most people. Much attention is given to the digital divide, which is only a part of a much broader and more problematic *development divide* (Hewitt de Alcántara 2001). The way to realise this potential and to understand ICTs' societal and developmental role is to locate ICTs within: (1) the broad contextual variability of socio-cultural and economic-political realities that exist in developing countries and countries in transition and (2) the context of communication and KM.

Intellectual roots for a relevant conceptualization of the relationship between ICT and development can be found, among others, in the work of appropriate technology. Stretching back to Schumacher's credo "Small is beautiful" (Schumacher 1974), appropriate technology supports the development and use of sustainable approaches to meeting human and ecological needs through the appropriate use of technology. Today's complex problems cannot be solved by using technology independent of its context (Hamelink 1999). To be appropriate, technology must be connected to the place, resources, economics, culture and impact of its use. This necessitates a strong human and culture-centred approach to applying ICTs in a development context. According to appropriate technology the impact of ICTs is emergent and dependent upon its social context (Soeftestad and Sein 2003).

ICTs as applied to development cooperation represents efforts to scale up traditional means of communication, in terms of numbers of stakeholders involved, and the volume, content and speed of communication. The *networked society* has been touted as the outcome (Castells 2000). At the same time there are the extremely complex and heterogeneous situations that ICTs are being applied to, and questions as to the rationale behind this work, and its short- and long-term implications. Access to ICTs is, perhaps, a *necessary* step in improving the climate for development in developing countries and countries in transition, but it is never a *sufficient* one.

4 The Community-Based Natural Resource Management Network

ICTs have led to a surge in networking activities in development cooperation. CBNRM Net (www.cbnrm.net) is one such network. To achieve its goal of contributing to social change, leading to more equitable and sustainable NRM, CBNRM Net reaches beyond EOC, and moves from an emphasis on information to knowledge, and to management of such knowledge. CBNRM Net aims to provide relevant KM services for the emerging global network of CBNRM stakeholders (this section is partly adapted from Soeftestad 2001a, 2001b, 2002).

4.1 History

CBNRM Net grew out of several intellectual lines of thought and operational activities in the World Bank in the 1990s in which one of us was actively involved. Two activities proved to be significant. The first was the World Bank Common Property Resource Management Network (CPRNet, www.cbnrm.net/webhosting/cprnet). Established in 1995, it was the first in-house effort to network between staff and outside practitioners and experts, and aimed at serving the needs of World Bank investment operations. The second was the international CBNRM workshop, Washington D.C., May 1998 (Soeftestad 1999). The workshop's applied context was training and capacity building in CBNRM. As the members of CPRNet and the participants in the May 1998 workshop realized, means of codification, storage, retrieval and dissemination of CBNRM knowledge were not avail-

able. Establishing a network of these stakeholders, supported by ICTs, seemed the correct way to proceed.

Both these activities were success stories, but neither was mainstreamed in World Bank operations. This paved the way for organizing them within a network of CBNRM stakeholders (in the case of the May 1998 workshop, a key recommendation presented to the World Bank was to establish such a network). Thus, CBNRM Net was established in 2001, and CPRNet was incorporated into CBNRM Net at the same time. CBNRM Net in this way represents continuity in networking stretching back to 1995.

4.2 Organization

CBNRM Net is formally organized as a project of the Norwegian non-profit 'CBNRM Networking' (www.cbnrm.com). The management structure is horizontal and devolved, and consists of a Coordinator (currently one of us), supported by input of members. While CBNRM Networking covers all expenses, those involved in managing CBNRM Net so far work for free. As the present Coordinator runs an own consulting firm, there are no conflicting allegiances, which is important in considering network vulnerability and transparency.

Membership is free, and carries the right to submit knowledge for posting in the Newsletter and on the Web site. The only obligation attached to membership is that members are requested to be actively involved in the running of the network, through producing knowledge and sharing it with fellow CBNRM stakeholders. There are two types of membership: individual and institutional.

Although there is increased interest among members and others in submitting knowledge, be it to the Newsletter or the Web site, the resources required to manage the network are manageable within the present administrative set-up. Requests for help and advice from members are increasing, and this, together with management of the membership database, is gradually becoming a time-consuming task. As CBNRM Net grows, a better-adapted management structure will have to evolve.

4.3 Knowledge Management and Knowledge Production

The rationale behind CBNRM Net is that, as individual CBNRM stakeholders and members of CBNRM Net – whether located in the public sector, the private sector or civil society – we all experiment and learn from our work. CBNRM Net provides the opportunity as well as the means for members to share their experiences with others. The key organizing principles for CBNRM Net's activities are a structured and detailed approach to KM, together with knowledge production. The organization of the Web site, including the CBNRM knowledge architecture that underlies it, is a testimony to this.

CBNRM Net's approach to KM consists of a series of reiterative steps that places KM in a larger context, and that aims, through a cyclical process of adaptability and flexibility, to ensure that useful knowledge is made available at the right place and at the right time (see Figure 1).

The KM aspect of CBNRM Net is currently being implemented. Regarding knowledge production the situation is different. Given the situation as regards, for example, member involvement, it has not yet been possible to work on this. One scenario is to network the knowledge already existing with members through intra-group sharing, leading to discussions and brainstorming that, in turn, would result in members reaching new understanding and insight of the issues concerned, located at a higher level of applicability and validity. This has implications for CBNRM Net's communication model.

4.4 ICTs and Evolution of a Communication Model

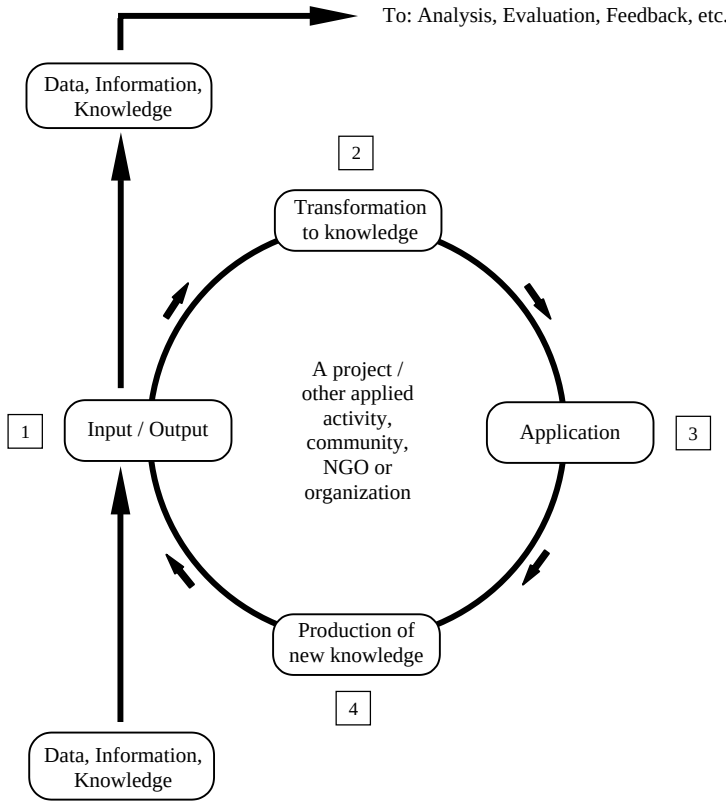
Initially, the emphasis was on the Web site. From the very beginning a cautious strategy was adopted, including using simple HTML without any embellishments. This is done in order to minimize download time and increase access for users with low hardware and software configurations and/or slow connections.

Gradually it became clear that members requested knowledge dissemination also through the Newsletter. The Newsletter is increasingly becoming the preferred means of communication between the members and the CBNRM Net management, as well as between the members (see Section 6.2). It is in the nature of CBNRM Net as an ongoing experiment in EOC that the communication model itself is changing over time.

To complement this emphasis on communication through use of ICTs, there is evidence that members who attend conferences and training at local, regional and global levels meet informally.

This face-to-face and more personal contact and communication is crucial, and is expected to increase as the network evolves.

Figure 1. Sequencing in CBNRM Net' s Approach to Knowledge Management and Knowledge Production



4.5 Membership: Thematic and Geographic Coverage

Regarding sectors and themes, members have a very broad expertise. When it comes to geographic coverage, members currently live and/or work in almost 100 countries. The majority of members in the North are working in developing countries and countries in transition. The relatively high membership in Africa is the result of a conscious effort to target this region (see Table 1).

Table 1. CBNRM Net, Membership in Regions of the World (October 2003)

Region	No. of Members
Africa (Sub-Sahara)	209
East Asia (incl. parts of peninsular South-East Asia)	30
Eastern Europe, West Asia and Central Asia (incl. Russia and countries in transition)	3
Latin America and the Caribbean (incl. Central America)	21
North Africa and the Middle East	4
North America	100
The Pacific (incl. parts of peninsular South-East Asia)	15
South Asia	42
Western Europe	79
Total membership	503

5 Related Networks

In order to understand and assess CBNRM Net, it will be useful to present a few related networks and networking activities briefly.

There are a number of related networks, most of which are best understood not as networks but as Web sites, projects or programs where networking is but one of several activities. The following are chosen for comparison (geographic references are included where necessary):

- CBNRM Asia Virtual Resource Centre (www.cbnrmasia.org).
- CBNRM Support Programme (Botswana, www.cbnrm.bw).
- Community-Based Coastal Resources Management (CBCRM) Resources Center (Philippines, www.cbcrmlearning.org).
- Decentralized Natural Resource Management (India, www.panchayats.org).
- FRAME (Africa, www.frameweb.org).
- IDRC CBNRM (Asia, www.idrc.ca/cbnrm).
- Livelihoods Connect (global, www.livelihoods.org).
- MekongInfo (www.mekonginfo.org).
- South Asia Human Development Forum Net (www.hdfnet.org).
- Tracker (Africa, www.nrmtracker.org).

These networks and networking activities have several things in common. Their approaches to KM reflect the specific circumstances under which they were established, and because of this it is not straightforward to make comparisons between them. Some differences can nonetheless be pointed out. A set of criteria has been selected to present these differences (see Table 2; see Table 3 for the complete set).

Table 2. CBNRM Net and Other Networks, A Comparison of Selected Criteria

Criterion	CBNRM Net	Other Networks
Web site architecture	Very simple	Often very complex
Membership based or not	Yes	As a rule not
Thematic focus	Very broad	Often specific issues
Geographic focus	Global	Mostly regional and country levels
Emphasis on political-economic dimensions	Substantial	Varies
Emphasis on knowledge, as opposed to information	Substantial	Varies
Flexibility	High	Low or non-existent
Directional flow	Both ways, but mostly to the target group	Almost completely to the target group
Hard/software and connectivity used	Very low	Often high, sometimes substantial
Technical insight expected of members/users	Very low	Often high
Concerned with using a broad suite of ICTs	Partly the Web and partly e-mail	A majority use only or primarily the Web
Openness	Substantial	Varies, mostly low

One of these networks warrants more scrutiny, namely Decentralized Natural Resource Management (DNRM) in India. It consists of a mailing list and a Web site. DNRM advocates values of democracy, equity, human rights and justice. The 325 members include, among others, government officials, implementers, academics, NGOs and activists. Discussions tend to be empirical rather than theoretical (Rajesh 2003). Some discussions have led to advocacy and action in favour of communities.

6 Analysis and Discussion

Keeping in mind that the focus is on EOC and on KM in CBNRM, this section is framed in terms of networking and networks.

6.1 On Networks

At its most fundamental, a network is a set of interconnected nodes. It may have a hierarchy but has no centre. Relationships between nodes are more or less asymmetrical, but all are necessary for the functioning of the network (Castells 1999). Networks exist at several levels, from global to local levels (Castells 2000). The global economy is networked, and globalization itself is an expression of the level, size and extent of networked interaction between its constituent elements.

The new more complex and inclusive approach to communication between stakeholders and to sharing of knowledge leads to networking between these stakeholders. Such networking becomes formalized in one way or another into networks.

Networks can be *providers* and *generators* of information and knowledge. They can also be *intermediaries*, that is, information and knowledge service providers with responsibility for information and knowledge brokerage and delivery.

The special type of network under focus here is understood as more or less formalized communication between numbers of like-minded stakeholders that share knowledge in various ways on a more or less regular basis. Whitten and Wolfe (1973) understand a network as relevant series of linkages between individuals that, under specific conditions, may form a basis for the mobilization of people for specific purposes. Networks can be informal and formal. These *social networks* are constituted by members that interact face-to-face. One type of social network is the *community of interest*, consisting of people who share a common interest in a particular topic, and that come together informally to share knowledge. Another type is the *Community of Practice*, a group of people involved in similar activities or in similar disciplines, and that come together to develop and share knowledge.

The advent of ICTs sets networks in contemporary society apart from earlier networks in some respects. The difference is fundamentally one of quantity and not of quality, in that communication goes faster and that one can reach many people at the same time. The availability of ICTs has led to increase not just in the number of networks, but also in tasks, size and scale. The use of ICTs is often a *sine qua non* for such networks, as ICTs make it possible for members to be located physically apart. Because of this, such networks are often referred to as *virtual communities* or *virtual networks*. Based on the weaker sense of community that virtual networks constitute, they are sometimes called *discourse communities* (Sharp 1997; Smith 1992). The members of a discourse community participate in a genre, that is, they have shared goals, they communicate with one another, and they use participatory mechanisms to provide information and feedback (Erickson 1997). Because of, among others, the physical separation of participants, the relationship between virtual networks and communities of practice is not clear. In the case of CBNRM Net we prefer to understand it as the latter. This is, perhaps, based less on present realities than on the direction in which CBNRM Net is likely to move.

Virtual networks are a visible effect of the growing clout of civil society and NGOs. They are also key avenues to further this growing importance. The effect of globalization on the global NGO sector is the realization that other people are grappling with the same problems. The promise of scaling up networks should be approached with care. Depending upon the circumstances, such scaling up may be difficult to achieve (Soeftestad 2002), and may be better approached by networking likeminded networks, that is, knowledge networking (see Section 3.1). Networks have a number of characteristics (see Table 3).

The criterion 'Flexibility' (see Table 3) is important. Flexibility is here understood as the unused potential for change (Bateson 2000). Understanding the essence of flexibility follows from the recognition and understanding that complexity and flexibility are closely connected. Flexibility is an essential aspect of functioning ecological and social systems, a key factor behind their high degree of adaptability. The same applies to technological systems, and to integrated social and technological systems. In CBNRM Net, flexibility is the result of an ongoing assessment of methods of working and priorities, resulting from members' input and participation. EOC can, as an integrated social and technological system, and within the context of networks, maintain flexibility in several ways:

- Cover the extent of cultures and types of social organization.
- Aim to be available to all stakeholders, across sectors (public, private and civil society) and levels (from local to global).

- Balance the emphasis on information and knowledge.
- Maintain a broad approach to issues considered as useful or relevant.
- Be sensitive to changes in the situation for stakeholders and how this affects the means-goals set-up.
- Emphasize the whole array of ICTs at disposal.
- Focus on the ultimate goal(s) and use ICTs as means to reach those goals.

Table 3. Networks: Characteristics and Criteria

Characteristic	Criteria
Administration	1. Organization – owners and managers 2. Management structure – horizontal or vertical 3. Funding – source 4. Membership based or not – if membership, what are the members' rights and obligations 5. Web site architecture
Focus	6. Thematic focus – sector(s) and/or issue(s) covered 7. Geographic focus – local, regional and/or global focus 8. Emphasis on political-economic dimensions 9. Emphasis on knowledge, as opposed to on information 10. Concerned with knowledge management and knowledge production 11. Concerned with training and capacity building
Structure (Barnes 1972; Kuper and Kuper 1985)	12. Size – number of members 13. Density – potential of communication 14. Centrality – an index of the accessibility to one another 15. Clustering – degree to which members form clusters of members who are more closely linked to one another than they are to the rest of the network 16. Flexibility – adaptability of communication and, more generally, the network
Interactions (Barnes 1972; Kuper and Kuper 1985)	17. Multiplexity – wether relations are single or multiple 18. Transactional focus – in a specific relation: (a) nature of goods and services, (b) degree of emotional involvement and (c) the confidences which are exchanged 19. Directional flow – in a specific relation: (a) who initiates communication and (b) the direction of the flow of things exchanged 20. Frequency – frequency of interactions 21. Duration – duration of interactions
ICTs	22. Hard/software and connectivity used 23. Technical insight expected of members/users 24. Concerned with using a broad suite of ICTs
Other	25. Openness – to collaboration with like-minded networks

Some of the criteria listed in Table 3, especially under the Characteristics 'Structure' and 'Interactions', are primarily aimed at social networks and not at virtual networks. In the case of CBNRM Net some characteristics are less applicable at the present time. However, as CBNRM Net evolves, it is a matter of time before they apply equally well.

6.2 CBNRM Net's Communication Model

As an integrated unity consisting of a Newsletter, a Web site, online databases and organizational aspects, CBNRM Net amounts to a *Web information system*. CBNRM Net is a *provider* and *generator* of information and knowledge, and it is an *intermediary*. In performing these functions and capacities it operates under a set of constraints and incentives that are partly identical with those that other networks experience. CBNRM Net is, however, situated apart from other networks in some respects (see Table 2):

- It is very much a bottom-up approach.
- It has no formal institutional affiliation.
- It is situated in between the accepted ways of organizing and networking, that is, it crosses, among others, administrative areas, cultures, languages, national borders, projects and sectors.
- It has developed a unique niche as a provider of services for the global CBNRM community of practice. In fact, it has contributed in a major way to developing this network, that is now becoming synonymous with CBNRM Net.
- It is integrated horizontally (connecting members in, for example, projects and sectors) and vertically (connecting members across organizational hierarchies in the public and private sectors as well as internationally).

The evolving communication model is influenced by these conditions. The key issue that comes out of discussions with members, as well as a member survey in 2002, is a concern with the Web site. While a few have suggestions for improving it, most members in developing countries and countries in transition have problems in accessing it (Rozemeijer 2002). Several members in the North report that they do not access the Web at all because of lack of time and a general feeling of information overload. This speaks to a potentially serious problem with communicating knowledge via the Internet, specifically the Web, and has led to increasing the emphasis on e-mail and the Newsletter (see Section 4.4).

However, also in the case of the Newsletter there are some hurdles. To give an example, recently some members, staff at a development project in a remote location in Mali, requested that they be taken off the CBNRM Net distribution list. They are hooked up via mobile phones and satellite, and their Internet service provider has set very low levels for the size of attachments. The Newsletters are now e-mailed to the project's head office in Bamako from where they are sent on via regular mail service.

This point to a limitation in the use of ICTs to network a constituency that is as varied and as physically separated as CBNRM stakeholders. At the same time, the present understanding of CBNRM Net's communication model leaves some things to be desired. The aspect of personal contact is by and large missing. It would be necessary to extend the communication model from the macro- to the micro-level to broaden the type and kind of contact between members. A gradual extension of the model is evident in that, as the network grows, people increasingly become aware of each other (see Section 4.4).

Regarding retrieving and presenting knowledge, be it in the Newsletter or on the Web site, it is difficult to please all members. And, in the final analysis, whatever knowledge is made available is largely up to the members themselves. To succeed in its mission, CBNRM Net will have to make the case that it is a network *by* its members, *with* its members and *for* its members. Building this sense of ownership is a key task that runs parallel with the above-mentioned functions.

6.3 Networks and Environmental Online Communication

So far, we have understood EOC to be communication about the environment using the Internet, specifically e-mail and the Web. We believe, however, that EOC has a greater potential. Based on the earlier discussion (see Sections 2, 6.1, 6.2) we present the following arguments:

- *Adaptability and flexibility*. Provide an emphasis on the goals with development cooperation and not just the means, that is, ICTs. Both networks and EOC would seem to be easily adaptable to each other and to the changing contexts and circumstances on the ground.
- *Move from information to knowledge as defining element*. Emphasizing the contextual dimension of information will enable better modeling of KM flows and needs in a given setting.
- *Networks as discourse communities or communities of practice*. Networks understood in this way (see Section 6.1) have important potentials in communicating environmental knowledge.
- *Knowledge networks*. There are major advantages to be gained in networking existing networks (Flor 2001; see Sections 3.1, 6.1).
- *Focus on incentive structures*. The incentives in developing countries and countries in transition to use objective information and knowledge are not strong. Furthermore, incentives are often found in the wrong areas, for example, as connected with funding and as fo-

cused on technical solutions. Incentives should take note of organizational processes and focus on institutional incentives (Richardson 2003). It is important to think long-term. The situation at the micro-level, including the community and the household, needs to be addressed. Motivational behaviour change using, for example, the techniques of social marketing should be considered (Andreasen 1995; Waisbord n.d.; Weinreich 1999).

- *Ways and means of communicating to be broadened*. It is necessary to search for new ways of communicating. The role of broadcasting is being looked at anew, especially digital radio (Eltzroth and Kenny 2003). Web-to-mail or distributing material on CD-ROMs may be alternate options. Open source solutions would contribute to decreasing costs and to development of local and specific-purpose Web applications.
- *The array of useful ICTs to be expanded*. This is supported in part by the growth in the convergence of ICTs through digitalization technology, which facilitates the integration of computers, telecommunications, broadcasting and consumer electronics, and in part by a concern with adapting ICTs to the cultural, social, socio-economic and technical realities at the point of use (Chapman and Slaymaker 2002; Soeftestad and Steen 2002).

Such a broad understanding of EOC would, we argue, lead to an emphasis on civil society and its relationship with the wider society. Just as the overarching goals of decentralization, governance, participation, stakeholder involvement and transparency are key elements in development cooperation, a broad conceptualization of EOC will benefit from this while, at the same time, contribute to further it. It follows that EOC operates on two levels: (1) an abstract, ideal and theoretical level and (2) a concrete and practical level.

We propose elements of a process for arriving at relevant EOC approaches, consisting of data collection and analysis. Depending on the circumstances, this can be an iterative process. Two different but connected types of analyses will have to be performed to assess relevant EOC-based networking activities:

- *Stakeholder analysis*. Determines the interests of the stakeholders in relation to the overall interest of the project or program (World Bank 2003a, 2003b). This is best done through regular stakeholder analysis.
- *Content analysis*. Determines what types of knowledge and information flows between which stakeholders, when and how (see Table 3). This is best done through detailed participatory observation and interviews, coupled with more general Poverty and Social Impact Analysis (PSIA).

6.4 The Network Analytical Model

The analyses used to arrive at relevant EOC approaches can be used as input to construct a formal Network Analytical Model (this section is abbreviated from Soeftestad 2002). This model can, in turn, be used to analyse the networks discussed in this chapter. The model consists of three interacting modes:

- *Modes of Coverage.* Identical with the stakeholder categories commonly recognized in development cooperation.
- *Modes of Organization.* The way stakeholders organize themselves. The Modes are: (1) *sector* (including agriculture, infrastructure and education), (2) *project*, (3) *issue* (including biodiversity, CBNRM, common property, conservation and research; see 'Issue' under Modes of Integration) and (4) *donor* (activities funded and implemented by donors).
- *Modes of Integration.* Addresses scale. To maintain the cohesiveness and integration as networks scale up, what is lost in direct communication is compensated for by a new form of integration at higher levels. The Modes are *space* and *issue* (understood in an interdisciplinary way; see 'Issue' under Modes of Organization).

Networks can be established and integrated along the Modes of Integration in two ways: (1) horizontally and (2) vertically (see Section 6.2). Horizontal integration means integration of stakeholders within the same level (in the sense of society or social organization). At the lower levels, horizontal integration will mostly be around issues. As one moves up towards the macro-levels the integration will increasingly take place also in space. Whereas horizontal integration takes place *within* levels, vertical integration takes places *between* levels. Horizontal and vertical integration often coexist, especially at the higher levels. Vertical integration can be identical with co-management or collaborative management.

7 Conclusions

The societal and developmental role of ICTs is to apply it in support of the major agendas of this day and age, including furthering democracy, decentralization and transparency, to ensure the well-being of the disadvantaged masses in developing countries and countries in transition. Social development is dependent upon our ability to establish interaction and synergetic relationships between human values and technological innovations. Thus, the challenge of ICTs is how to sensitise and humanize it to play a key role in this crucial agenda. Scaling ICTs to serve various needs within development cooperation, that is, aligning the needs of various stakeholders with the means at disposal, becomes a humanizing project, addressing both inter-personal and inter-cultural relations (Såmmé 1997).

ICTs must strive to emulate key elements and values of the countries and cultures in which they are being used. At the same time, as ICTs are being applied to the area of inter-cultural communication, it must contribute to aligning the diversity and heterogeneity of cultures. In this way ICTs may contribute to engender a cultural pluralism and a plurality of knowledge systems (Worsley 1997). Several of these arguments come together in a call for EOC to emphasize flexibility (see Section 6.1 and Table 3).

There are short-term and long-term obstacles to realizing relevant applications built around this agenda. In the area of knowledge we need to understand more about specific ICTs and their point of interaction with people and cultures. In the area of communication there is much to be desired in connection with understanding inter- and intra-cultural aspects of communication and their interfaces with ICTs. We need to establish networks of stakeholders in order to bridge the various disconnects, disparities and fault lines. For this to happen we need to talk together, and for this ICTs and EOC is a suitable means and tool, bearing in mind that – depending upon the choice of ICTs – EOC can be both inclusive and exclusive.

As an instrument in achieving sustainable development the emphasis on public consultation in environmental decision-making has, together with the focus on communication (but somewhat contrary to the rationale behind the use of ICTs), been understood as a bottom-up approach. It follows that public involvement is being used and understood in conjunction with emphasis on a number of related approaches and tools, including participation and stakeholder consultation. It also follows from a reorientation of governments away from 'command-and-control' and market mechanisms towards what has been referred to as 'societal instruments' in order to enable widespread public and civil society involvement. There is a close connection between public consultation and EOC. The latter can contribute decisively and in a meaningful way to public consultation and thus in public involvement, at several societal levels, in generating discussions and agreed-upon outcomes. Good examples at the global level include issues in the domain of global commons and global public policy, including the Clean Development Mechanism (CDM) from the Kyoto Protocol, the management of straddling and highly migratory fish stocks, the conservation of the living resources of the high seas, and the sustainable use of seabed resources, as foreseen in the United Nations Convention on the Law of the Sea. Other relevant topics concerning environment and development are included in several multilateral treaties and agreements.

CBNRM Net's EOC model concentrates on fostering an open and inclusive dialogue involving all stakeholders, aimed at participation in defining and implementing sustainable NRM strategies, and ensuring ownership of these strategies by all involved stakeholders. The strategic use of available communication tools, as defined by the emerging EOC process and model, will help ensure such inclusion.

EOC is a promising tool for addressing key issues in development cooperation connected with communication, knowledge and meaning. But first we might do well to think through what EOC is, namely a mode of speeding up human communication across time and space. EOC can repackage human communication and it can increase its reach – but it cannot improve upon the essence of human communication. On the other hand, it stands the risk of reducing the content and usefulness of human communication. Herein lies the key to harnessing the promises of EOC: exploring the potentials while keeping clear of the dangers.

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