Reaching Consensus on Principles of Federal Scientific and Technical Information Dissemination

Many STI managers in the Federal agencies, along with scientists, engineers, scholars, librarians, and vendors who specialize in STI, recognize the highly leveraged role of Federal STI in renewing the U.S. competitive edge. However, during most of the 1980s, sharp debate over several key elements of Federal information policy and the resulting lack of consensus have prevented the STI community from sending a clear message to top congressional and executive branch policymakers. The most controversial aspects of STI policy have been:

- the Federal role in information dissemination;
- principles of STI dissemination;
- policy on the open flow of STI; and
- role of the governmentwide dissemination agencies.

In all these areas, electronic technologies aggravate old issues or create new ones.

During the last year and a half, the debate in Congress has advanced to the point where a greater degree of consensus and, thus, legislative action is possible. Unanimous consent may be unlikely on some issues, but if the potential of STI is to be realized, a working consensus is needed. This chapter discusses the debate over principles of STI dissemination, including the Federal role. Chapter 4 covers the policy debates on the open flow of STI, and on the role of the governmentwide dissemination agencies.

The ongoing information policy debates are directly relevant to efforts by the 101st Congress to update public laws on Federal information dissemination—including the Paperwork Reduction Act, Printing Act, Depository Library Act, and Freedom of Information Act.[1]

Federal Role in Information Dissemination

STI has been caught up in the philosophical debate over the role of the Federal Government in disseminating Federal information to the public. All sides of the debate agree on the need for some Federal role, but agreement on specifics, especially with respect to the relative roles of the government and private sector in dissemination, is more elusive. Federal STI is relevant to both the missions of the research and development agencies and to governmentwide dissemination objectives. In the absence of a governmentwide strategy or policy for STI dissemination, the development of a comprehensive information dissemination policy under the auspices of the Office of Management and Budget (OMB) is of greater importance.

OMB and Circular A-130

OMB is the dominant force in shaping Federal STI dissemination policy.[2] Its role was strengthened by the Paperwork Reduction Act of 1980,[3] which established an Office of Information and Regulatory Affairs (OIRA) within OMB. The Act was amended in 1986 to explicitly include information dissemination within its scope.[4] The Act assigns the OIRA Director broad responsibilities to minimize the cost and maximize the usefulness of information collected, maintained, and disseminated by the Federal Government. Further, the Act requires the OKRA Director to develop and implement Federal information policies, principles, standards, and guidelines with respect to information collection and dissemination. The Act also requires each Federal agency to

[1] For a detailed discussion of how technology has outpaced the law, see U.S. Congress, Office of Technology Assessment, *Informing the Nation: Federal Information* Dissemination in an Electronic Age, OTA-CIT-396 (Washington, DC: U.S. Government Printing Office, October 1988).

[2] See, for example, C.R. McClure and P. Hernon, *U.S.* Scientific *and* Technical *Information* Policies: *Views* and *Perspectives* (Norwood, NJ: Ablex publishing Corp., 1989); C.R. McClure, P. Hernon, and H. Relyea (eds.), United States Government Information Policies: Views and Perspectives (Norwood, NJ: Ablex Publishing Corp., 1989); statement of Harold B. Shill, Associate Professor, West Virginia University, on behalf of the West Virginia Library Association and West Virginia University Libraries, before a May 23, 1989, hearing of the House Government Operations Subcommittee on Government Information, Justice, and Agriculture; statement of Harold B. Shill, on behalf of the American Library Association, Legislative Assembly, before a July 14, 1987, hearing of the House Committee on Science, Space, and Technology, Subcommittee on Science, Research and Technology.

[3] Public Law 96.511, Dec. 11, 1980.

[4] Public Law 99-500, Oct. 18, 1986, and public Law 99-591, Oct. 30, 1986.

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designate a senior official to be responsible for agency compliance with OIRA policies, principles, standards, and guidelines on information collection and dissemination.[5]

While the authority of OIRA clearly extends to information dissemination, Congress did not—at least in the Paperwork Reduction Act—provide guidance on the shape, direction, or even basic philosophy of information dissemination policies that might be promulgated by OIRA. Part of the reason for this omission is that, at the time the Paperwork Reduction Act was being debated and enacted, other committees were considering legislation on the printing chapters of Title 44 of the U.S. Code (chs. 1-19; the PRA is ch. 35) that would have addressed key aspects of information dissemination.[6] This parallel legislation was not enacted. And Congress has not yet provided explicit statutory guidance to OIRA on information dissemination policy, although the 101st Congress is considering a variety of legislative proposals to amend various chapters of Title 44.[7]

OMB's efforts during the 1980s to promulgate governmentwide information dissemination policy proved to be controversial.[8] Much of the controversy focused on the role of the private sector in information dissemination and charges to be levied for use of Federal information dissemination. Both the draft and final versions of OMB Circular A-130 on "Management of Federal Information Resources" emphasized that Federal agencies place ''maximum feasible reliance' on the private sector for information dissemination, and that costs be recovered through user charges where appropriate.[9]

The final December 1985 version of OMB Circular A-130 gave more explicit recognition to the importance of government information, but still emphasized the role of the private sector. Thus, Federal agency dissemination must be either "specifically required by law' or "[necessary for the proper performance of agency functions, provided that the information products and services disseminated ''do not duplicate similar products or services that are or would otherwise be provided by other government or private sector organizations."[10] In effect, in the absence of statutory guidance to the contrary, OMB applied the philosophy of OMB Circular A-76 regarding contracting out of commercially available services in general to information dissemination in particular.[11]

However, A-76 does not address or define what dissemination functions are "inherently" governmental, that is, are ''so intimately related to the public interest so as to mandate performance by

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[5]Public Law 96-511 as amended, sec. 3501, 3504, 3506.

[6]H.R. 5424, the ''National publications Act of 1980," 96th Cong., 2d sess., Sept. 27, 1980.

[7]See, for example, H.R. 3695, the ''Paperwork Reduction arid Federal Information Resources Management Act of 1989, " 101st Cong., 1st sess., Nov. 17, 1989; S. 1742, the "FederalInformationR esources Management Act of 1989," 101st Cong., 1st sess., Oct. 6, 1989; and H.R. 3849, the ''Government Printing Office Improvement Act of 1990,' 101st Cong., 2d sess., Jan. 23, 1990. For related discussion, see OTA comments on S. 1742 prepared for a Feb. 21-22, 1990, hearing of the Senate Committee on Governmental Affairs, and the statement of Fred B. Wood, OTA, on H.R. 3849 before a Mar. 7, 1990, hearing of the Committee on House Administration, Subcommittee on Procurement and Printing.

[8]See OTA, *Informing the* Nation, op. cit., footnote 1, ch. 11; H.C. Relyea, J. Bortnick, and R.C. Ehlke, *Management* Of Federal *Information Resources: A* General Critique of *the* March *1985 OMB Draft Circular* (Washington, DC: Congressional Research Service, Library of Congress, July 5, 1985); and P. Hernon and C.R. McClure, *Federal Information* Policies in the *1980s:* Conflicts and Issues (Norwood, NJ: Ablex Publishing Corp., 1987). Also see "Librarians Fight Government Plan,'' New York Times, Feb. 21, 1989, p. A17; J. Markoff, "Giving Public U.S. Data: Private Purveyors Say No," New York Times, Mar. 4, 1989, pp. Al, 47; J. Markoff, "Policy Shift on Access to U.S. Data,'' New York Times, Apr. 10, 1989, pp. Dl, D8; D. Sherwood, "Data Wars,'' Government Executive, April 1989, pp. 24 ff; C. Webb, "Government Databases: Competing With Private Services?" *Presstime*, April 1989, pp. 18-20; T.J. McIntosh, "Electronic Age Offers Promises, problems for Government Information,'' *BNA* Daily Report for Executives, Aug. 11, 1989, pp. C-1 to C-17; and W.J. Moore, "Access Denied," National Journal, Jan. 20, 1990, pp. 121-124.

[9]Office of Management and Budget, draft, ''Mamgement of Federal Information Resources, " Federal Register, vol. 50, No. 51, Mar. 15, 1985, pp. 10734-10747; Office of Management and Budget, Circular A-130, "Management of Federal Information Resources, " vol. 50, Dec. 24, 1985, pp. 52730-52751.

[10]OMB Circular A-130, sees. 9(a) and (b).

[11]J. Timothy Sprehe, ''DevelopingFederal Information Resources Management Policy: Issues and Impact for Information Managers,' Information Management Review, vol. 2, No. 3, 1987, see pp. 33-41; and OMB Circulars A-76, Aug. 4, 1983, and A-130, Dec. 12, 1985.

Government employees.' '[12] OTA's prior analysis of National Technical Information Service (NTIS) and Government Printing Office (GPO) privatization proposals suggested that many NTIS and GPO dissemination functions are not suitable for privatization. Many other agency information dissemination functions arguably are vital to agency performance of statutory missions. There have been few credible analyses of the factors that make contracting out of Federal information dissemination cost-effective. Such analyses are difficult.[13]

OMB Circular A-130 has been widely interpreted by agencies as strongly encouraging, if not requiring, user charges for information dissemination. However, a careful reading of A-130 indicates that pricing decisions, unless specifically prescribed by statute, are left up to the discretion of agency heads, who may set charges no greater than that required to recover the cost of dissemination and who may waive or eliminate charges if necessary to carry out mission objectives.

STI Agencies and Circular A-130

The net effect of Circular A-130 has been to polarize views on Federal information dissemination policy, divert significant time and resources into debate over what A-130 is or should be, and create uncertainty or risk aversion among Federal agencies with respect to dissemination. Federal science agencies were not immune from this policy environment. Some STI agencies, notably NTIS and various agency information clearinghouses and libraries, had to defend their programs against privatization proposals. In the case of NTIS, OMB's insistence on privatization--which was later overruled by Congress--might have resulted in a 2- or 3-year delay in its modernization. Some STI agencies have adopted a defensive, low-profile attitude toward information dissemination, as a way of coping with the A-130 environment.

OMB's privatization policy could have accelerated if A-130 went unchanged and Federal agencies issued their own departmental regulations to implement A-130. The Department of Commerce is a case in point: it is particularly important because several Commerce agencies have significant STI functions (e.g., NTIS, National Oceanic and Atmospheric Administration (NOAA), National Institute of Standards and Technology (NIST), and the Patent and Trademark Office (PTO)).

In August 1988, the Department of Commerce issued a draft policy on electronic information dissemination.[14] Commerce was the first and, as yet, only Federal agency to develop a proposed comprehensive policy. The draft was prepared by a departmental task force and was intended to carry out the requirements of the Paperwork Reduction Act and A-130. The draft policy was circulated for comment and revised several times, but was never published in the Federal Register and has since been put on indefinite hold, due to the change in administration and more recently to the subsequent changes in OMB policy direction. Nonetheless, it is useful to review the original Commerce draft policy as an example of what might emerge as agency implementation of A-130 if left unaltered.

The basic thrust of the draft Commerce policy was that ''[operating units will use private sector firms to develop, manage, and operate electronic dissemination activities to the maximum extent possible,' and that, "before initiating electronic information dissemination, operating units will conduct a privatization analysis. " The proposed policy placed the burden of proof on the agency to "justify any proposed direct Federal role in disseminating electronic information in terms of overriding public need, law, and/or program mission. ' The directive was particularly burdensome with respect to the development and dissemination of value-added electronic information products and services, and in the marketing and distribution of agency information, all functions which the Department felt should be carried out primarily by the private sector. The Department, in its own "highlights" sheet, noted that, as a standard of performance, Commerce's

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[12] OMB Circular A-76.

[13] OTA, *Informing the* Nation, op. cit., footnote 1, ch. 12. Also see F.B. Wood, ''Proposals for Privatization of the National Technical Information Service: A Viewpoint,'' Government Publications Review, vol. 15, 1988, pp. 403-409.

[14] U.S. Department of Commerce, Draft Department Administrative Order on "Electronic Information Dissemination,'' Aug. 5, 1988, published in part as "Draft Policy of the U.S. Department of Commerce on the Dissemination of Information in Electronic Format" Government Information Quarterly, vol. 6, No, 1,1989, pp. 89-96.

Federal information dissemination policy development appears to be moving toward a compromise on two of the most contentious issues: the roles of the government and the private sector; and the application of user charges.

electronic dissemination activities should "[o]ffer no value-added features. Likewise, the draft policy placed the burden of proof on the agency to justify why fees to recover the actual costs of dissemination should not be applied.

Overall, the proposed policy placed so many substantive and procedural hurdles in the path of agency electronic dissemination activities that innovation and creativity could have been seriously impaired. Even though the policy stipulated procedures by which agency components could have justified government electronic dissemination and/or fee waivers, the procedural burden was high enough to discourage agency initiatives.

An Emerging Consensus?

In Informing the Nation, OTA reviewed a large number of agency-specific and governmentwide statutes with regard to congressional intent on information dissemination. While the Paperwork Reduction Act itself provides little direct guidance, taking as a whole the body of public law, OTA concluded that congressional intent is clear:

> In general, unimpeded dissemination of and access to Federal information is encouraged or frequently required and is vital to performance of agency and programmatic missions established by statute as well as to the principles of open government and a democratic society .15

OTA suggested that Congress consider making a renewed commitment to the overriding principle of public access established by Congress in other statutes, but updated to reflect the increasingly electronic nature of Federal information. In particular, OTA suggested that Congress consider enacting a congressional version of the information dissemination principles addressed in OMB's Circular A-130.[16]

Since publication of Informing the Nation, a number of other key reports, OMB draft policies, and, recently, congressional testimony and bills have been issued.[17] Federal information dissemination policy development appears to be moving toward a compromise on two of the most contentious issues: the roles of the government and the private sector; and the application of user charges.

The shift in OMB thinking is illustrative. In January 1989, OMB issued an "Advance Notice of Further Policy' to revise A-130 that was interpreted as favoring private sector over government dissemination of Federal information, limiting agency dissemination to basic and not value-added electronic information products, and requiring user fees to recover the costs of dissemination, absent compel-

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[15] OTA, *Informing* the Nation, op. cit., footnote 1, p. 259.

[16] Ibid., p. 260.

[17] See, for example, J.J. Berman, "The Right to Know: Public Access to Electronic Information," paper prepared for the Markle Foundation in P.R. Newberg (cd.), New Directions in Telecommunications Policy, vol. 2, Information Policy and *Economic* Policy (Durham, NC: Duke University Press, 1989); statements of J.J. Berman, Director, Information Technologies Project, American Civil Liberties Union, before an Apr. 18, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture, and a Feb. 22, 1990, hearing of the Senate Committee on Governmental Affairs; G. Bass and D. Plocher, Strengthening Federal Information Policy: Opportunities and Realities at OMB, Benton Foundation Project on Communications and Information Policy Options (Washington DC: The Benton Foundation 1989); statement of David Plocher, Staff Attorney, OMB Watch, before a May 24, 1989, hearing of the House Committee on Administration Subcommittee on procurement and Printing; statements of Nancy Kranich, Director of Public and Administrative Services, New York University Libraries, on behalf of the American Library Association and D. Kaye Gapen, Dean of Libraries, University of Wisconsin, on behalf of the Association of Research Libraries, before a May 23,1989, hearing of the House Committee on Government Government Operations, Subcommittee on Government Information, Justice, and Agriculture; statements of Alan F. Westin, President, Reference Point Foundation, and Professor of Public Law and Government, Columbia University, and Kenneth B. Allen, Senior Vice President for Government Relations, Information Industry Association before an Apr. 18, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information% Justice, and Agriculture; H.H. Perritt, Jr., Electronic Acquisition and Release *of Federal* Agency *Information*, Report to the Administrative Conference of the United States, Oct. 1, 1988; statement of Henry H. Perntt before a July 11, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture; and Administrative Conference of the United States, Recommendation 88-10 on "Federal Agency Use of Computers in Acquiring and Releasing Information," adopted Dec. 8-9, 1988.

ling reasons to the contrary.[18] The public comment on the January OMB notice was overwhelmingly critical.[19] OMB concluded that the January draft did not accurately communicate OMB's policy views and had further confused and polarized the debate. As a consequence, on June 15, 1989, OMB issued a "Second Advance Notice of Further Policy Development on Dissemination of Information" that formally withdrew the January 4 notice,summarized the comments received, and presented OMB's reactions and preliminary conclusions.[20] On June 16, OIRA Administrator Jay Plager announced the withdrawal in testimony before the Subcommittee on Government Information and Regulation of the Senate Committee on Governmental Affairs.[21]

The June 15, 1989, OMB notice deserves careful scrutiny by the STI community, because OMB intends to prepare anew draft policy consistent with the discussion in the June 15 notice and with any relevant legislation that may be enacted. (The new draft will also incorporate information collection, based on a 1987 draft and comments received thereon.[22]) If history is any guide, the penultimate OMB policy can be expected to have a significant impact on Federal STI dissemination.

The essence and significance of the June OMB notice is captured in the following quotation:[23]

> OMB wishes to make clear that its fundamental philosophy is that government information is a public asset; that is, with the exception of national security matters and such other areas as may be prescribed by law, it is the obligation of the government to make such information readily available to the public on equal terms to all citizens; that to the extent the flow of information from the government to the public can be enhanced by the participation of the private sector, such participation should be encouraged; and that participation by the private sector supplements but does not replace the obligations of government. These principles apply whatever the form, printed, electronic, or other in which the information has been collected or stored. OMB did not intend that either OMB Circular A-130 or the January 1989 notice should have the effect of dissuading agencies from carrying out activities they believe are necessary for the proper performance of agency functions . . . or that Federal agencies or the public should be made to rely primarily on the private sector for the dissemination of government information.

Principles of STI Dissemination

Converging views on the Federal role in information dissemination has made legislative action possible. Various congressional committees are developing legislative proposals to provide OMB and Federal agencies with specific statutory guidance on information dissemination.[24] Legislation and related OMB policy can be expected to have a significant impact on Federal STI dissemination.

The STI community needs to monitor, carefully review, and participate in the development of these initiatives to ensure that governmentwide dissemination principles are consistent with those appropri-

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[18] Office of Management and Budget, "AdvanceNotice of Further Policy Development on Dissemination of Information," FederalRegister, vol. 54, No. 2, Jan. 4, 1989, pp. 214-220.

[19] See summary of comments in Office of Management and Budget, "Second Advance Notice of Further Policy Development on Dissemination of Information." Federal Register, vol. 54, No. 114, June 15, 1989, pp. 25554-25559.

[20] Ibid.; also see J. Markoff, "O.M.B. Proposes Switch in Information Policy," New York Times, June 10, 1989, p. A-28; and U.S. Office of Management and Budget, "Summary of Comments on OMB's Second Advance Notice of Further Policy Development on Dissemination of Information," Oct. 19, 1989.

[21] Testimony of Jay Plager, Administrator, OMB Office of Information and Regulatory Affairs, before a June 16, 1989, hearing of the Senate Committee on Governmental Affairs, Subcommittee on Government Information and Regulation. Also see testimony of Jay Plager before a June 28, 1989, hearing of the House Committee on Administration Subcommittee on Procurement and Printing; see U.S. Congress, House, Committee on House Administration, Subcommittee on Procurement and Printing, *Title* 44 U.S. C.-Review, Hearings, May 23, 24 and June 28,29, 1989, 101st Cong., 1st sess. (Washington, DC: U.S. Government Printing Office, 1989), pp. 152-159.

[22] See Office of Management and Budget, "Policy Guidance on Electronic Collection of Information" Federal Register, vol. 52, No. 152, Aug. 7, 1987, pp. 29454-29457; and OMB, "Summary of Comments on Policy Guidance on Collection of Information," Nov. 17, 1987.

[23] OMB, "Second Advance Notice," op. cit., footnote 19, p. 25557.

[24] See H.R. 3695 and S. 1742, op. Cit., footnote 7.

ate for STI, and, if not, to make sure that separate guidance is provided for STI.[25]

Strengthening Public Dissemination of Value-Added Federal STI

Most agree on the need for public dissemination of STI, but there are differences on how this should be achieved. One serious complication for STI occurs when unclassified information is deemed to be sensitive for reasons of national security, foreign policy, or competitiveness. In these cases, the goal of public access may conflict with other policy objectives. Policy on the open flow of STI is treated as a separate issue area and discussed in chapter 4. The Federal science agencies emphasize that the primary purpose of Federal STI is to support agency R&D missions, and that public dissemination is an important but secondary objective.

A further complication occurs when value-added Federal STI is involved. Some government and information industry officials have argued that Federal agency electronic dissemination of raw data was acceptable, but government dissemination of value-added information was not an appropriate governmental function and should be the province of private industry.[26] In this view, dissemination by the U.S. Geological Survey of STI on magnetic computer tape would have been appropriate, but USGS dissemination of value-added or enhanced information would not--e.g., a compact optical disk with data on earthquake monitoring that also included the search software for retrieving and manipulating the data.

Value-added is not the best determinant to distinguish between government and private-sector roles. Many Federal science (and other) agencies have legislative responsibilities to develop and disseminate value-added information, and have been doing so for decades. Restricting the Federal agencies from providing value-added information, or from providing information available on paper in electronic form, would prevent some Federal agencies from meeting statutory obligations. Value-added restrictions could prevent agencies from providing the benefits of electronic technologies through automated data services to taxpayers who collectively paid for the development of the information in the frost place.

Federal agencies should be able to provide value-added information that furthers agency missions, but they should carefully consider private-sector capabilities, so that contracting out and marketplace alternatives are utilized when appropriate. Private information vendors (commercial and not-for-profit), on the other hand, should be encouraged to repackage and resell Federal information (that is not classified or otherwise restricted), and to add further value to create enhanced information products and services where the market exists. Whether government or private dissemination is preferred, however, should not be based on ideology, but on which mode(s) can best serve national needs.

Improving Cost-Effectiveness and Diversity of Federal STI

OMB has long supported agency automation programs in the belief that automation will be cost-effective in the long term. The judicious use of electronic technologies could lead to more timely, complete, and accurate Federal information dissemi-

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[25]For historical perspective on the development of information dissemination principles, see, for example, U.S. Executive Office of the President, Domestic Council, National Information Policy, report to the President of the United States (Washington, DC: National Commission on Libraries and Information Science, 1976); J.H. Yurow, R.F. Aldrich, R.R. Belair, Y.M. Braunstein, D.Y. Peyton, S. Pogrow, L.S. Robertson, and A.B. Wildavsky, *Issues* in *Information* Policy, report prepared for the National Telecommunications and Information Administration, U.S. Department of Commerce, NTIA-SP-80-9 (Washington, DC: U.S. Government Printing Office, February 1981); U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information and Individual Rights, Government Provision of Information Services in Competition With the Private Sector, Hearing, 97th Cong., 2d sess. (Washington, DC: U.S. Government Printing Office, Feb. 25, 1982); Rep. Glenn English, "Electronic Filing of Documents With the Government: New Technology Presents New Problems," Congressional Record-House, Mar. 14, 1984, H1614-1615; U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture, Electronic Collection and Dissemination of Information by Federal Agencies, Hearings, Apr. 29, June 26, and Oct. 18, 99th Cong., 1st sess. (Washington DC: U.S. Government Printing Office, 1986); U.S. Congress, House, Committee on Government Operations, Subcommittee on Government Information Justice, and Agriculture, Electronic Collection and *Dissemination of Information* by *Federal Agencies: A* Policy Overview, House Report 99-560, 99th Congress, 2d sess. (Washington, DC: U.S. Government Printing Office, Apr. 29, 1986); U.S. Congress, House, H.R. 2600, Securities and Exchange *Commission* Authorization Act of 1987, 100th Cong., 1st sess., June 4, 1987; U.S. Congress, House, Committee on Energy and Commerce, Securities and Exchange Commission Authorization Act, report to accompany H.R. 2600, 100th Cong., 1st sess., Rep. No. 100-2% (Washington, DC: U.S. Government Printing Office, Sept. 9, 1987); and U.S. Congress, House, Committee on Government Operations, Federal Information Dissemination Policies and Practices, Hearings, Apr. 18, May 23, and July 11, 1989, 101st Cong., 1st sess. (Washington DC: U.S. Government Printing Office, 1989).

[26]This view was reflected in the U.S. Department of Commerce, Draft Administrative Order on "Electronic Information Dissemination," Aug. 5, 1988, and the Office of Management and Budget "Advance Notice of Further Policy Development on Dissemination of Information," Jan. 4, 1989.

Federal agencies should be able to provide value-added information that furthers agency missions, but they should carefully consider private-sector capabilities, so that contracting out and marketplace alternatives are utilized when appropriate.

nation. However, the 1980s offer several examples of agency electronic dissemination projects that went astray or suffered serious and sometimes costly problems. In part, this is the price of innovation and progress-and neither is private sector R&D immune from "wrong tracks," "blind alley s," and "learning the hard way." Nonetheless, this points up the need for better ways for Federal agencies to share learning among themselves and the private sector. The most cost-effective route may sometimes be primarily an agency initiative, at other times defer entirely to the private sector, or develop collaboratively by the agency and a private firm. There is room for more creative approaches in optimizing Federal investment in information dissemination. While cost-effectiveness is an important criterion, it must be balanced with the principal goals of fulfilling the statutory R&D requirements of the science agencies and promoting public dissemination of STI.

It is important to maintain and broaden the avenues used for dissemination of Federal information, including STI. For STI, these avenues are:

- the Federal science agencies themselves;
- the governmentwide dissemination agencies such as NTIS and GPO;
- the press (including print and electronic media and a wide range of specialized scientific and technical journals and newsletters);
- commercial information vendors (ranging from small companies that specialize in a few areas of STI, to very large corporations with entire divisions devoted to STI publishing, databases, etc.);
- not-for-profit information vendors (including university and foundation-based providers);
- researchers and scholars who collect, analyze, and synthesize Federal STI and disseminate the results through multiple channels (ranging from conference presentations, to congressional testimony, to technical reports);
- professional, consumer, and trade associations that specialize in areas relevant to STI (and process and redisseminate STI to their own constituencies);
- the library community (including public, private, special, academic, research, and school libraries throughout the Nation);
- State and local governments and associations; and
- foreign countries and companies that use Federal STI for policy or commercial purposes.

Involving Users and Providers in STI Planning

Planning for Federal information (including STI) dissemination should provide opportunities for the users and the public to participate in the process, as well as the appropriate agencies. Inadequate involvement of the potential users has led to past failures in new information services. User involvement is especially important for STI, because user groups are often highly specialized and sophisticated.[27]

Some agency officials are concerned that public participation in STI planning could become cumbersome and slow down or discourage agency innovation. On one hand, the use of public funds for information systems to carry out public purposes suggests the need for an open process. On the other hand, procedural red tape could chill agency innovation, as it sometimes has in the private sector. The key is to match the procedural requirements to the purpose, nature, and scale of the project. For example, multi-million dollar systems like the National Aeronautics and Space Administration's EOS (Earth Observing System) or the Securities and Exchange Commission's EDGAR (Electronic Data Gathering and Retrieval) may be required to follow rigorous public notice and participation procedures. At the other extreme, small pilot or demonstration projects may be required to include public notice but not to use a formal comment period, meetings, and approval procedures that may be needed for large operational projects.

[27] See statements of Charles R. McClure, Syracuse University; Fred B. Wood, OTA; and Joseph G. Coyne, U.S. Department of Energy before a hearing of the House Committee on Science, Space, and Technology, Subcommittee on Science, Research, and Technology, Oct. 12, 1989.

Most user and provider groups support the alternative concept of marginal cost recovery—meaning that user charges for Federal information dissemination would not exceed the marginal cost of dissemination and would not include costs of collecting or creating the information.

Determining User Charges for Federal STI

User charges continue to be controversial. Some at OMB have advocated full cost recovery for Federal information dissemination. Under this policy, user charges for Federal information could have been set to recover the entire costs of collecting, processing, and maintaining as well as disseminating. This proposal was opposed by both user and provider groups, on the grounds that much Federal information-including STI—would be priced out of reach, and that the taxpayer would effectively be asked to pay twice.[28]

Experience with Landsat STI suggests that the academic research community is particularly burdened by full cost pricing. Responsibility for pricing of Landsat imagery and digital data has moved in the past from the U.S. Geological Survey (USGS) to the National Oceanic and Atmospheric Administration and finally to EOSAT, a commercial company established under the Land Remote-Sensing Commercialization Act of 1984.[29]

During the 1980s, Landsat STI prices have been increased to recover a greater portion of full costs to the point where 1989 EOSAT prices are about nine times higher than 1980 prices for imagery and three times higher for digital data.[30] This has reduced sales to academia by more than half.[31]

Transition from manual imagery interpretation to digital data analysis explains part of the reduction in imagery sales, but examination of worldwide Landsat sales for 1981-88 shows that users are paying much more for much less. For example, between 1981 and 1988, the volume of data digital sales increased by only 10 percent while the revenue from digital data sales increased by about 600 percent. During this same period, the volume of imagery sales decreased by about six times, while the corresponding revenues increased by 10 percent.[32] Full cost prices are affordable by some large government agencies and private corporations (U.S. and foreign), but these prices have squeezed research activities performed by academia, State/local governments, small business, individuals, and some Federal agency programs that are faced with tight budgets (including, ironically, some USGS programs).[33]

Most user and provider groups support the alternative concept of marginal cost recovery-meaning that user charges for Federal information dissemination would not exceed the marginal cost of dissemination and would not include costs of collecting or creating the information. The definition of ‘‘marginal cost” is ambiguous. Three definitions have been suggested:

1. Marginal cost is the incremental cost of producing the n+l unit of a specific information product or service. Thus, the cost per copy of a printed report would be the direct cost of producing one more paper copy; the cost of a database would be the direct cost of one more

[28] Full cost recovery has also been opposed on legal grounds. The courts have ruled that, under the User Fee Act of 1952 (31 U.S.C. 9701), user fees charged by Federal agencies must be reasonably related to the direct and indirect costs of providing a product or service. For relevant decisions, see 846 F.2d 765 (D.C. Cir. 1988); 777 F.2d 722 (D.C. Cir. 1985); 554 F.2d 1109 (D.C. Cir. 1976); and 554 F.2d 1094 (D.C. Cir. 1976).

[29] U.S. Congress, Public Law 98-365, July 17, 1984. For general discussion of Landsat commercialization% see U.S. Congress, Office of Technology Assessment, Remote Sensing *and the* Private Sector: *Issues for* Discussion, OTA-TM-ISC-20 (Washington, DC: U.S. Government Printing Office, March 1984); U.S. National Commission on Libraries and Information Science, Information Policy Implications *of Archiving* Satellite *Data:* To Preserve the sense *of Earth* From Space (Washington, DC: 1984); and National Research Council, Space Applications Board, Remote Sensing of the Earth From *Space:* A Program in Crisis (Washington, DC: National Academy Press, 1985).

[30] G. Metz, ‘‘Landsat Product Price Examples, 1980- 1989,” EROS Data Center, Sioux Falls, ND.

[31] The percent of total EROS sales to academia declined from 10% in FY1979 to 5% in FY1988 for Landsat imagery, and from 14% in FY1979 to 5% in FY1988 for Landsat data. In FY1988, only 408 frames of imagery and 379 data items were sold to academic users.

[32] G. Au@ R. Pohl, and G. Metz, A Summa ry of Worldwide *Landsat* Sales: 1988 (Sioux Falls, SD: EROS Data Center, U.S. Geological Survey, May 30, 1989).

[33] Also see G. Austin, *Annual Report of Landsat Sales* for *Fiscal* year 19&3 (Sioux Falls, SD: EROS Data Center, U.S. Geological Survey, 1989).

electronic copy (e.g., on magnetic tape) or one more hour of online access time.

2. Marginal cost is the average cost of producing a specific product or service. Here, the cost per copy of a printed report would be the total costs of producing n copies divided by the number of copies. The cost of a database would be the total costs of providing the database divided by the number of service units (e.g., magnetic tape copies, hours of access time).
3. Marginal cost is the average cost of a group of products or services (i.e., a product line). Thus, the cost per copy of a printed report would be the total costs of producing $n_1+n_2+n_x$ copies of $m_1+m_2+m_y$ reports divided by the total number of copies. The cost of a database would be the total costs of providing n databases divided by the total number of service units for all databases combined.

Definition 1 is the true economic marginal cost. But if the intent is to recover the cost of dissemination but not the costs of collecting or creating the information, then definitions 2 and 3 could apply. True marginal pricing reflects only direct variable costs (e.g., labor and materials used in printing), whereas average costs typically also cover direct freed costs (e.g., production line supervision, electricity) and some share of indirect costs (e.g., building rent, marketing, general management, capital investment).

A major policy question is whether the price formula should apply to an individual information product or service or to a line of products and services; what costs elements should be included (variable, fixed, direct, indirect); and how much flexibility agencies should have in pricing. The demand for Federal information varies widely, and per-unit costs for the high sales volume items will be relatively low, while per-unit costs for the low-volume items will be relatively high.

For example, the user charge for a compact optical disk could vary from $5 to $500 depending on the pricing formula and volume of demand. At a sales volume of 500 copies, the true marginal cost (definition 1) would be about $5 per copy and the average cost (definition 2) typically $50 to $100 per copy. At a sales volume of 50 copies, the marginal cost might increase to $10 to $20 per copy and the average cost to $500 per copy. Thus true marginal cost yields the lowest price, but leaves much of the cost of dissemination uncovered. The uncovered costs would have to be paid from appropriated funds. The average cost formula covers the cost of dissemination, but is very sensitive to total volume. For high-volume items, average cost is low and vice versa.

As an illustration, NOAA appears to use definition 2 above, the average cost of producing a specific product or service, as the basis for pricing. NOAA includes both direct and indirect costs in its calculations. Typical direct costs are labor, supplies, printing, and computer resources. Indirect costs cover a portion of NOAA and U.S. Department of Commerce overhead and rent. The costs of collecting or creating the data are not included. NOAA calculates the total direct and indirect cost of producing each product or service, and divides the total cost by the quantity produced to determine a per-unit cost. Assuming that estimated demand meets or exceeds the quantity produced, the unit price is usually set to equal the unit cost.

The cost breakdown for several NOAA National Geophysical Data Center CD-ROM products is shown in table 1. The Geophysics of North America CD-ROM was relatively expensive to produce, but the unit cost was kept down due to the higher estimated sales volume and quantity produced. The Gloria CD-ROM was a pilot project subsidized by USGS—thus the low price. And the Deep Sea Drilling CD-ROM was inexpensive to produce, with a low unit price even with modest estimated demand.

Many STI items have low total sales, and thus the price could be prohibitive if calculated on an average-cost-per-product basis (definition 2). Low-demand STI items might be best suited for either true marginal cost pricing (with the rest of the costs covered out of appropriated funds) or average-cost-per-product-line pricing (definition 3). Both the National Technical Information Service (NTIS) and National Library of Medicine (NLM) use product-line pricing, which in effect results in a cross-subsidy between the high-demand and low-demand items. NTIS and NLM believe that use of true marginal cost pricing (definition 1) would threaten their viability, unless appropriated funds were provided to cover the rest of the costs; and that use of average cost pricing per product (definition 2) would further curtail demand for many of the lower volume information products and services, since prices for

Table I—Cost Breakdown for Illustrative National Geophysical Data Center CD-ROM Products

Product	Cost elements: Direct labor	Other direct	Indirect rests	Quantity	Unit cost
Geophysics of North America: CD-ROM	$66K	$58K	$40K	700	$235
Documentation	23K	8K	14K	700	65
Software	53K	44K	32K	700	185
Gloria Side Scan Sonar: CD-ROM	6K	[a] —[a]	3K[a]	200	45
Deep Sea Drilling Project CD-ROM	6K	9K	3K	200	90

[a]USGS paid for the development of this pilot CD-ROM project.

SOURCE: National Geophysical Data Center, 1989.

these items would likely rise out of reach of many users.

NTIS must operate its clearinghouse on a break-even basis with no appropriated funds. NTIS uses revenues from brokerage fees and services to other agencies, along with product-line pricing, to help offset the losses that would otherwise occur due to the many NTIS documents that register no or very low sales volume. The sale or lease of Federal STI in electronic formats is now the fastest growing market segment for NTIS, increasing at 5 to 10 percent annually. "Electronic" sales account for about one-quarter of total NTIS revenues.[34]

NTIS sales of paper or microfiche documents continue to decline, with annual sales of indices, newsletters, published searches, and technical documents reaching all-time lows in fiscal year 1989. The average total demand for NTIS documents is about 10 copies over the life of a document, and one-quarter to one-third of the documents never sell a copy.[35]

Financing the NLM dissemination program is more complicated since (unlike NTIS) NLM does receive appropriated funds for creation of databases. This means that NLM must determine where tax-supported information collection or creation ends and user-financed information dissemination begins. According to NLM, online database prices are set to recover only the cost of dissemination (except for foreign users, who pay full cost since they presumably have not paid taxes). NLM uses average cost product-line pricing, which means that users pay the same average price for all databases ($27/hour during peak periods). The most heavily used database (MEDLINE) absorbs much of the overhead costs and helps keep prices down for the other databases (e.g., TOXLINE, AIDSLINE, CANCERLIT).[36] However, vendors are concerned that NLM combines both offline products (e.g., magnetic tapes) and online services when estimating costs, and cross-subsidizes not only from MEDLINE to other databases, but from offline products to online services through the use of royalty fees.

The NLM example raises several pricing questions. How should agencies distinguish among collection, creation, maintenance, and dissemination costs? What costs should be included in determining average or marginal cost? What products and/or services should be included in determining costs? Under what circumstances should products and services be kept separate or combined, for pricing purposes? Should agencies cross-subsidize different products and services, and if so, to what degree? How should product lines be defined, when calculating average costs over a range of products and/or

[34]FY 1989 NTIS sales of software and data sets from the NTIS inventory were $2.59 million, leasing of NTIS and other agency databases $2.35 million, and brokerage of other agency electronic items $1.41 million for a combined 'electronic' sales of $6.35 million-about one-fourth of the $24.4 million total revenues.

[35]For further discussion see OTA, *Informing the* Nation, op. cit., footnote 1, chs. 5 and 12; and testimony of Fred B. Wood of OTA before a Feb. 24, 1988, hearing on NTIS privatization and a Mar. 8, 1990, hearing on NTIS modernization held by the House Committee on Science, Space, and Technology, Subcommittee on Science, Research, and Technology.

[36]Chairman, Board of Regents, National Library of Medicine, memorandum to the Assistant Secretary for Health, U.S. Department of Health and Human Services, "Response to Systems Review Board Recommendations on the Pricing of NLM Products and Services," May 29, 1984; and K.A. Smith, "Government Databases: The NLM Philosophy," Database, vol. 11, No. 3, 1988, p. 58.

services? How should agencies set prices for dissemination to special user groups such as foreign users who do not pay taxes or not-for-profit users who cannot afford even the average cost? Should agencies be able to retain sales revenues to help offset dissemination costs? (NLM retains about one-half or $6 million/year in an NTIS deposit account, and returns the rest to the U.S. Treasury.)

Whatever one's views on pricing formulae, there is a general consensus that user charges should not exceed the cost of dissemination, and that agencies should be able to reduce or waive user charges if needed to carry out agency missions. Should this pricing philosophy become governmentwide policy, reconciliation of other statutes might be necessary. For example, Title 44 of the U.S. Code requires that the Superintendent of Documents (SupDocs) set prices for government publications at cost plus 50 percent.[37] However, as a practical matter, in recent years the House and Senate Appropriations Committees have transferred net revenues from the SupDocs sales program to support the Depository Library Program (and thereby correspondingly reduce the need for DLP appropriated funds). Also, in 1988, Congress authorized the National Oceanic and Atmospheric Administration to assess fees based on ''fair market value' for commercial users of certain NOAA information products and services (governmental, university, and not-for-profit users would pay only marginal costs) .38 NOAA officials have found it difficult to determine fair market value, and both agency and industry officials question whether this is a viable basis for setting user charges.

Defining Intellectual Property Rights in Federal STI

STI developed by or for the Federal Government, like other types of Federal information, by law may not be copyrighted. Some researchers and vendors include Federal information in scholarly works or commercial products that are copyrighted (e.g., a vendor who copyrights a new compact optical disk that includes bibliographic STI from multiple sources, one of which is the Federal Government).

The major issue concerns the use of so-called ''copyright-like' devices by Federal agencies. Several science agencies use licensing agreements in their dissemination programs. NLM makes its online database MEDLINE available to both online and compact optical disk vendors, through a licensing agreement that levies charges estimated to equal the average per-unit cost for a user of the NLM line of databases.

NTIS similarly licenses its bibliographic database to private vendors through a licensing agreement and also serves as licensing agent for other agencies' databases

The National Agricultural Library (NAL) distributes its AGRICOLA bibliographic database to vendors via NTIS. NTIS charges vendors $2,000/year for the yearly AGRICOLA data on magnetic tape, and $200/year for back fries. NTIS retains all of this revenue. NTIS also charges online vendors $6 per AGRICOLA connect hour and $0.05/' 'hit" (a bibliographic citation on the desired subject), and CD-ROM vendors a fee equal to 25 percent of the disk sales price. These online and CD-ROM user fees are split 20 percent to NTIS and 80 percent to NAL.[39]

Some private vendors view such licensing arrangements as restrictive and illegal.[40] These vendors believe that agency licensing agreements discourage competition among commercial services and/or inhibit demand, and have the effect of restricting access to Federal STI. Other vendors find licensing agreements acceptable so long as they are nonexclusive and fairly priced. The NLM and NTIS licensing agreements appear to be nondiscriminatory in that any vendor can be licensed, and the fees are set to recover the cost of databases and related

3744 U.S.C.1708.

38S. 2209, Title IV, sec. 409.

39Gary K. McCone, National Agricultural Library, U.S. Department of Agriculture, letter to Fred B. Wood, Office of Technology Assessment, U.S. Congress, Dec. 28, 1989.

40For discussion of concerns about the NLM MEDLINE database, see U.S. Congress, House, Committee on Government Operations, *Electronic* Collection andDissemination, Oct. 18, 1985, Hearings, and Apr. 29, 1986, Report, op. cit., footnote 25; and statement of P. James Terragno, President, Maxwell Online, Inc. before a July 11, 1989, hearing of the House Committee on Government Operations, Subcommittee on Government Information, Justice, and Agriculture. For the NLM view, see NLM, ''Comments on the Twenty-Eighth Report by the Committee on Government Operations, ' June 5, 1986; and "NLM Policy on Database Pricing," December 1989.

operations.[41] Nonetheless, some vendors question whether the online connect hour charges accurately reflect identifiable government costs that vary as a function of the level of use or number of subscribers.

Some users and vendors believe that it would be better for agencies to provide information free of charge or charge only the true marginal cost. This, according to these vendors, would reduce or eliminate cost as a barrier to access, and presumably eliminate concerns about fees in licensing agreements. NASA's National Space Science Data Center (NSSDC) operates largely without fees. NSSDC disseminates computer tapes at no charge (if the tapes are returned after copying) and allows limited access to online databases, also at no charge, for scientific or educational use by:

. NASA installations;
. NASA contractors and grantees;
. other Federal agencies, contractors, or grantees;
. colleges and universities;
• State or local governments; and
• not-for-profit organizations.

NSSDC charges other users the marginal cost of $45 per magnetic computer tape (or $25 if the user supplies the tape) and direct processing costs for larger amounts of online database use. Online users pay their telecommunication charges, whether access is director over networks. NSSDC does not yet have a policy for high-density storage media such as CD-ROM.

NAL's AGRICOLA currently recovers about $60,000 per year of online revenues. At NLM, NTIS, and other agency data centers (e.g., NOAA's NGDC), revenues based on average cost pricing (and licensing agreements) comprise a much larger part of their operating budgets. The impact of changes in pricing policy would vary widely among agencies. Detailed financial analyses would be required to estimate revenue shortfalls-and the necessary compensating appropriation increases-under various pricing and licensing scenarios. And even if price was not an issue, some kind of agreements could be needed to maintain quality control and protect the integrity of agency databases. An agency has a valid interest in assuring that quality standards are met, a stated purpose of NLM's licensing agreements (along with cost recovery).

The de facto copyright of Federal information through the transfer of patent rights or rights in technical data from the Federal Government to contractors, employees, or private parties (e.g., companies, universities) presents another problem. Both Congress and the President have encouraged closer collaboration between the government and private sector to facilitate the commercialization of technology developed by or for the Federal Government. The transfer of patent rights and rights in technical data can encourage technology transfer, but both might restrict access to Federal information. High-tech companies and universities benefit from this policy, but the information industry, librarians, and the general public are concerned that access to Federal STI could be impaired if the policy is carried too far (see ch. 4 discussion).

Enhancing the Role of the Private Sector

The Federal Government can encourage the private sector in several ways: First, the government should ensure open and equitable access for those who seek Federal information regardless of cost. Second, the government is expected to assist the library and educational institutions distribute Federal information through technology-enhanced dissemination. This will require rethinking the future roles of libraries and schools in the information age, including new arrangements with the government and commercial sectors.[42]

Third, the commercial information industry expects the government to provide equitable, competitive conditions for contractors and vendors involved in Federal information dissemination. The Securities and Exchange Commission and Patent and Trademark Office have proposed 'exchange agreements' whereby private contractors would provide the agencies with "free" automation services in return for exclusive rights for redissemination of agency information. These agreements were bitterly contested by Congress and the information industry as anticompetitive and have since been modified or

[41] For a recent debate, see R.C. Atkinson, "A Question of Information Policy," editorial, Science, vol. 246, Nov. 10, 1989, p. 733; and D.A.B. Lindberg, "Information Policy," letter to the editor, Science, vol. 246, Dec. 22, 1989, pp. 1547-1548.

[42] See OTA, Informing f& *Nation*, op. cit., footnote 1, chs. 6 and 7; Association of Research Libraries, Technology *and U.S.* Government *Information* Policies: *Catalysts for* New Partnerships (Washington, DC: October 1987); U.S. Congress, Office of Technology Assessment, *Linking* for Learning: A New Course in Education, OTA-SET-430 (Washington, DC: U.S. Government Printing Office, November 1989); and U.S. Department of Education, Office of Library programs, Rethinking *the* Library in the Information Age (Washington, DC: U.S. Government Printing Office, October 1988).

Increased availability of Federal STI in electronic formats should stimulate and strengthen the private-sector role in STI dissemination.

terminated. The industry insists that, when contractors disseminate Federal information, the agencies should be obligated to provide the same information on equal terms to any interested vendors.

The information industry is also sensitive to the prospect of direct competition between Federal agencies and commercial vendors. The industry now recognizes the legitimacy of direct government dissemination. The views of the Information Industry Association have changed from opposition to any direct electronic dissemination by government, to opposing agency dissemination of value-added but not basic or raw government information. The industry now supports a partnership or complementary relationship between government and industry. For example, improvements in agency dissemination of STI could stimulate new opportunities for private sector development of innovative STI products and services that cut across agency and disciplinary lines.

Some vendors now offer a variety of bulk rate, off-peak, and discount products and services to governmental and not-for-profit customers. The industry opposes any copyright-like restrictions on Federal agency information, and prefers that licensing or other agreements be offered on a nondiscriminatory basis to all competitors. The industry benefits from obtaining Federal information in electronic forms, since the cost of converting electronic information to commercial applications is typically less than working from paper formats. It follows that if the benefits of electronic formats are available to the commercial sector, they should also be available to the not-for-profit sector (e.g., libraries, universities, and noncommercial companies such as OCLC, Inc. and Reference Point, Inc.[43]).

Increased availability of Federal STI in electronic formats should stimulate and strengthen the private-sector role in STI dissemination. This has been shown to be true with online and compact optical disk formats. Collection and creation of the Federal STI databases and documents are paid for by the taxpayers. The development cost of many of these databases is beyond what most private organizations could afford or would risk on such a venture. These databases are a shared national resource. New electronic technologies enable the Federal science agencies to prepare and maintain these databases and distribute them to the public-including the private sector. Private vendors are thus assisted by the government in their business of redisseminating, repackaging, and enhancing Federal STI and converting it into marketable products and services.

Electronic Federal STI should also benefit commercial telecommunication companies.[44] As electronic Federal STI is accepted by users and demand for online services increases, the use of telecommunication gateway services should likewise increase. Market stimulation should extend to the Bell operating companies, long distance telephone carriers, commercial value-added networks, and also not-for-profit networks. The latter include the Online Computer Library Center network, Research Libraries Information Network, Western Library Network, and scientific networks such as Bitnet and NSFnet (operated by Educom and the National Science Foundation, respectively).

[43]Reference Point has recently initiated a project to develop a global environmental information network fOr the exchange Of information on climate change, deforestation, loss of biodiversity, and other global environmental challenges.

[44]For general discussion of the U.S. communications infrastructure, see U.S. Congress, Office of Technology Assessment *Critical Connections:* Communication for *the Future*, OTA-CIT-407 (Washington DC: U.S. Government Printing Office, January 1990).