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Environment 1.0: Infoterra and the making of environmental information

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Abstract
This article traces international conflicts over the making and operation of the first global environmental information system, Infoterra (1972–2003). By studying the negotiations among international actors over what kinds of information, expertise, and technological infrastructure were deemed appropriate to constitute Infoterra, we gain insight into what was made to count as environmental information, and how "the environment" was communicated to multiple audiences in the early decades of the global environmental movement. The article argues that the struggles around Infoterra demonstrate the key role attributed to information systems for global environmental communication, with lasting impacts on pragmatic responses to environmental problems today.

Keywords
Communication technologies, environmental information system, global communication, new media history, United Nations Environment Programme

Environmental information systems (EISs) are today central to the management and monitoring of global climate, water, and land issues. The category is broad, encompassing such diverse systems as remote sensors, geographic information system (GIS) mapping and visualization; computer simulators, inventories and databases; and environmental accounting and reporting modules. EISs are critical components of climate infrastructure. In an era that assigns immense value to big data analyses, network-driven digital devices,

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and other expressions of the so-called sensor society (Andrejevic and Burdon, 2015), EIS data occupy an elevated role as reliable, accurate, and reality-generating sources of knowledge. This perspective is embedded even further by major international institutions such as the Intergovernmental Panel on Climate Change, which rely on EIS data to make authoritative claims about the environment that impact political decision-making.

While EISs have been evaluated in terms of their application in economics, science, technology, engineering, and development paradigms, their role in *communicating* about the environment remains largely unexplored (Mathur, 2009; cf. Pillman, 2000). Yet, as I contend in this article, EISs have critical implications for how we communicate what counts as environmental information in the first place. EISs are valuable subjects for communication studies in terms of both their infrastructure and their content. Through various means, and via varying formats, EISs help to control what a system of environmental topics, data, and expertise consists of; and how this information is communicated to different audiences. Environmental information systems, Kim Fortun writes, "structure what people see in the environment, and how they collaborate to deal with environmental problems … they are technologies designed to produce new truths, new social relationships, new forms of political decision-making, and ultimately, a renewed environment" (Fortun, 2004: 54).

In this article, I focus on the case of Infoterra, considered by some to be the first ever global EIS (Haklay, 1999). Infoterra emerged from deliberations at the 1972 United Nations Conference on the Human Environment (UNCHE) over the need to develop international responses amidst a growing recognition of world environmental crisis. Initially conceived as a "referral mechanism" (Martyn, 1981: i), an administrative service through which national bodies would refer institutional queries about an environmental issue to an organization registered with the system, Infoterra would expand over the next three decades to constitute a computerized network of substantive documents, subject topics, and expert resources. By the time the network was discontinued in 2003, made redundant by more powerful technological, legal, and political systems, it had served to consolidate connections—both practical and symbolic—that in my view contributed to making the characteristics of the environment as we think of it today.

The conceptualization of the Infoterra network in the 1970s was indebted to more than the mandate of a single international event or organism. Infoterra appears at the confluence of cultural, technological, and political forces in the Cold War era. In this article, I analyze the impact of particular ideas from this time period about globalization, international culture, and technology on the development of this network. My main argument is that Infoterra constitutes one of the earliest inputs to how the environment became seen as a global problem to be managed by Western interests. By looking at the evolution of Infoterra throughout the 30 years of its existence, we can understand not only technological, temporal, and spatial developments around the production of environmental information but also cultural transformation: namely, the making of the environment into a "global" problem, presented as actionable and indeed solvable by the provision of particular kinds of information and communication by certain types of Western expertise.

It is a truism of environmental communication studies that our conception of the environment is shaped largely by media and mediation (e.g. Hansen and Cox, 2015; Lester,

2010). Environmental communication scholarship has striven to account for the myriad ways media and communication processes have represented, mapped, framed, and otherwise shaped public and political opinions and decisions over time. Cutting-edge work across multiple disciplines has explored the symbiotic relationships between media and environment, pointing to ways that media technologies and platforms for communication evolve in tandem with transformations in environmental action and philosophy (e.g. Atkinson et al., 2016; Lemenager, 2014). In particular, the so-called elemental approach in media studies recognizes diverse ways that the environment exists as a condition of media (e.g. Parikka, 2014; Russill, 2013). What we know about the earth's resources is derived from what we *can* know about them through the production of knowledge via such media as computer models (Edwards, 2010), satellites (Parks, 2013), or underwater infrastructure (Starosielski, 2015). These media manage data that are used for politics and production, rendering the earth calculable and predictable.

In this article, my aim is to show how EISs constitute a mediated form of environmental discourse and thereby contribute to how we make sense of "the environment." By focusing on the first global EIS to emerge, I identify nascent struggles over what environmental information is supposed to look like, which actors are considered authorities in the debate, and what kinds of mediation are deemed appropriate for the task of environmental communication and awareness.

The birth of a network: Imagining an EIS, 1972–1977

Between 5 June and 16 June 1972, representatives from 113 nations met in Stockholm for the UNCHE. Billed as "the first planet-wide conference on the quality of the human environment" (Sterling, 1972b), the summit is widely considered to have crystallized the concept of the environment as a shared transnational concern requiring an international policy response. The conference's motto, Only One Earth, and its logo depicting "man" in his biosphere were meant to symbolize the conference's central raison d'être: human potential to control nature's gifts amidst the certain finitude of its resources. Publicity photographs framed conference speakers as tiny figures dwarfed by the massive round logo hanging on the wall above them (Figure 1), a poignant counterpart to the iconic "Blue Marble" photo taken by Apollo 17 astronauts later that year (Caldwell, 1973; Edwards, 2010). The publication, also that same year, of *The Limits to Growth*, a report by Massachusetts Institute of Technology (MIT) researchers casting unchecked increases in world population, industrialization, pollution, food production, and resource depletion in crisis terms, added to the sense of urgency that accompanied preparations for the conference (Meadows et al., 1972).

Three themes prevailed at the UNCHE conference, themes that also informed the burgeoning environmental movement at that time. The first theme was the generalized concern that technology, including the technologies of mass-mediated communication, was itself responsible for compromised health and environmental harm (UN A/CONF.48/5, 1972: 9–13). Set against the backdrop of Cold War anxieties, shocking recent historical events such as Agent Orange and the proliferation of interest in nuclear power, as well as growing concerns over the toxic impacts of industrial electronics (among other industries; see Grossman, 2006), the conference aimed to address growing

Figure 1. United Nations Secretary General Kurt Waldheim opens the United Nations Conference on the Human Environment in Stockholm.
Source: *UNESCO Courier* (January 1973).

unease over technological developments gone out of control.[1] One of the desired outcomes of the conference was therefore to reframe technological progress as beneficial to the environment rather than as something to be avoided.

The second theme addressed the idea that the environment was truly a global crisis, requiring global solutions. Speaking at a press conference at the opening of the UNCHE, the Conference Secretary General Maurice Strong insisted that the event would be historic if member states could accept responsibility that their actions affected the environment of other states (UN HE/124, 1972). Another hoped-for outcome was therefore "an international consensus on an environmental ethic and on the basic principles that should guide the environmental relationships of the international community" (UN A/CONF.48/5, 1972: 13).

The third theme was that of information as a panacea for world environmental problems. The UNCHE conference in 1972 inaugurated a formal link between information and the environment, crystallizing the idea that communication between nations about environmental issues would raise awareness, aid decision-making, and contribute to better policy. In his own introduction to the conference, United Nations (UN) Secretary General Kurt Waldheim called the conference a "global attack on perils menacing the environment." While acknowledging that issues of poverty and international development remained "the highest priority and an unreached objective," the UN saw its goal as inspiring collaboration by all member states to participate in the collection of "worldwide data to measure, to warn, to exchange experience and to review proper implementation" of environmental action (UN HE/123, 1972).

These three themes were made clear by the Universal Declaration on the Protection and Preservation of the Human Environment, the statement of rights and obligations adopted during the summit. Mathur (2009) suggests that the Universal Declaration constitutes the first "official international emphasis on environmental communication," referring to two principles of the Declaration in particular:

> Principle 19: It is … essential that mass media of communications avoid contributing to the deterioration of the environment, but, on the contrary, disseminate information of an educational nature on the need to protect and improve the environment in order to enable man to develop in every respect.
>
> Principle 20: Scientific research and development in the context of environmental problems, both national and multinational, must be promoted in all countries, especially the developing countries. In this connection, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems … (quoted in Mathur, 2009: 135)

In addition to the Declaration, an Action Plan for the Human Environment was prepared by the UN Secretariat and adopted at the conference, ideally as a means of making concrete some of the Declaration's principles. A total of 109 recommendations made up the Action Plan, whose primary aim was to increase national policies and infrastructures around environmental issues. Information provision is a dominant feature of the Plan: 31 of the 109 recommendations contain specific injunctions for information creation, collection, access, mapping, and exchange. The need to produce and circulate information about the environment was put forward in conjunction with calls for institutional and technical infrastructure, national and regional self-sufficiency, collaboration between nations with similar geographic and spatial situations, and the need for public awareness building.[2] Recommendation 97 was among the most explicit:

> It is recommended that the Secretary-General make arrangements … to establish an information programme designed to create the awareness which individuals should have of environmental issues and to associate the public with environmental management and control. This programme will use traditional and contemporary mass media of communication, taking distinctive national conditions into account. In addition, the programme must provide means of stimulating active participation by the citizens, and of eliciting interest and contributions from non-governmental organizations for the preservation and development of the environment. (United Nations Environment Programme [UNEP], 1972)

It was according to these premises that the UNEP was created as a permanent agency, a global body that would act as "the environmental conscience" of the UN system. Founded by Maurice Strong, UNEP at its inception consisted of a 58-nation Governing Council, a Secretariat for daily operations, and an Environment Fund, to which national governments were invited to contribute on a voluntary basis.

More than the environmental conscience of the UN, UNEP was also meant to function as the international eyes and ears of the world environmental situation. Chief among its mandates was the implementation of Earthwatch, a set of monitoring and assessment systems designed to collect, compile, analyze, and disseminate data about problematic activities in the international community such as air and water pollution, actions causing climate change, and use of toxic chemicals.[3]

The communications portion of Earthwatch would become known as Infoterra.[4] Infoterra was imagined as a decentralized, cooperative, and freely accessible network of information sources from around the world pertaining to national or regional environmental problems. An initial budget of US$20m per year over 5 years was allocated to develop the EIS, in the hopes of creating "an international standard of environment" (Smith, 1975). The network would ideally provide

> an international referral service for sources of environmental information, the encouragement and awareness of the role and importance of information in environmental decision-making, the stimulation of development of national systems for processing environmental information, and the promotion of an awareness of environmental problems. (Martyn, 1981: 3)

Although the Infoterra system would draw on the facilities of the International Computing Center in Geneva, its management team at UNEP would reside in Nairobi, Kenya, a highly symbolic gesture meant to signal at once the geographic interconnectedness of environmental issues and the potential for developing nations to take charge of their own information and communication systems.

In the next section, I investigate the way that environmental information was imagined within the Infoterra network. I show how the three themes introduced above—the theme of the environment as a global issue, the theme of technology as a boon to the environment, and the theme of information as a panacea for world problems—became encoded within the network structure. Information systems do not just house available information; they are not neutral repositories that store and diffuse undifferentiated bits of data (Gitelman, 2013). They are systems of power as much as they are systems of communication and exchange. The task at hand is to examine how certain kinds of data, experience, or expertise attain the status of information; and what happens when this information circulates through its network.

Making environmental information: Infoterra and the new world information/communication order

Even in the early 1970s, the concept of "environmental information" was already deeply shaped by national interests. To the extent that there was something "out there" called the environment and that it constituted a global problem, the solution of creating and

distributing "global" information about the environment to a "global" community was mired in political and economic concerns that reflected specific national priorities.

Starting in the late 1960s, research reports about international media and communication practices began to surface at international forums. These reports noted the unidirectional flow of news and information distribution from developed to developing nations (Nordenstreng, 2013), and called for not only new philosophies but also specific courses of action to remedy the imbalance. Suggested activities included a more equitable distribution of media infrastructures and equipment along with training of personnel and forums for exchange. Communication scholars Pavlič and Hamelink assembled these claims under the rubric of a "new international/world information/communication order," and examined their potential in conjunction with broader claims for economic sovereignty among developing nations (Pavlič and Hamelink, 1985).

Despite a growing awareness of the need for more equitable information and communication policies and planning to achieve the promises of a so-called global information society, the Action Plan produced by the Stockholm Conference maintained a narrow view of environmental information. Most if not all of the UN information systems of this era perpetuated the notion that information originated in developed countries and served the needs of developing nations (and maintained this paradigm well into the 1990s). Sources of information were considered a separate category from users of information. While the primary value assigned to environmental information in the Infoterra network was promoting awareness, the network structure proved that only developing countries were considered to be lacking in this resource. The American international relations scholars Haas and Ruggie demonstrate this perspective in their 1981 evaluation of 192 information systems maintained by the UN:

> To upgrade the quality of policy or the sophistication of decision making is the intended objective of any intergovernmental information system. But it is not the only consequence imaginable. A possible second-order consequence is particularly important to governments of developing countries and to officials of many international organizations. Here, information and equal access to it are seen as vehicles for reducing dependency in economic and cultural relations. Participation in international information systems makes possible some net transfer of information from North to South, be it in the realm of basic research, or more politicized data concerning trade, technology, or capital; it also provides the occasion for the independent production of such information by the South itself. Thus, on the premise that knowledge is power, the redistribution of access to knowledge is seen as a potential means to compensate for the lack of material bases of power in developing countries—as a means to substitute "brains" for "muscle," in short, and thereby to enhance the capacity of poorer countries to act beyond the limitations imposed by the world distribution of material resources. (Haas and Ruggie, 1981: 980)[5]

Unsurprisingly, developing countries decried this lopsided interpretation of information transfer (and would continue to call for a more balanced perspective—see Amin, 1977; Bhagwati, 1977; Bratteli, 1976); but in the early 1970s, this vision was deeply entrenched for several reasons. The idea that developing countries could improve their environmental situation through increased information access follows the "deficit model" of science literacy that was popular at this time: individuals deficient in scientific

understandings have a social obligation to gain scientific literacy in order to make informed decisions about their society's future (Bauer et al., 2007). At the level of global politics, the deficit model has an even stronger normative and boundary-making function. In order for the environment to become the product of an interconnected global system, individuals must gain the same kind of literacy around the same types of information. Since the production of knowledge around the environment was not "global" but deeply shaped by Western interests, attempts at global consensus inevitably undermine non-Western input.

A second determining feature behind the Infoterra network's development lay in cost considerations. Between 1969 and 1972, the enforcement of new rules and institutions to manage environmental problems across the industrialized countries had sparked domestic concerns over the costs of such enforcement. In the United States, the passage of the National Environmental Policy Act of 1969 and the creation of the Occupational Safety and Health Administration in 1970 had sent companies and other organizations scrambling to institute new environmental policies to adhere to the new regulatory infrastructure. There was little interest by such organizations in committing additional funds to international environmental concerns, much less admit directly to the role these organizations may well have played in perpetuating these concerns.

In this light, communication about the environment in the form of a global information exchange network was lauded in Stockholm less because of the conviction that information could solve global environmental problems than because it was a cost-effective solution (Conley, 2006). Of course, the notion that environmental information could aid countries to make better decisions about economic development was not in itself misguided. However, presented as a substitute for material assistance, as the provision of "brains" instead of "muscle," the major players at the UNCHE sought primarily to sidestep what they saw as extra economic commitments.

Despite the pretense to global cooperation, then, the creation of Infoterra reflected Western economic concerns. The US contribution to the environment fund, the brainchild of President Nixon, provided a maximum of US$20m for 5 years, of which half was designated for Earthwatch and half for *all other environmental activities across all UN agencies*. This was a pittance compared to the amounts spent by Western concerns on their own environmental issues. A reporter at the *Washington Post* did not hesitate to qualify the budget as such:

> Ten of the twenty million [allocated for the new environment fund] will go towards a global monitoring and assessment program called Earthwatch. More exactly, it will go towards a small new Earthwatch program tacked on the billion-dollar-a-year one already operated by the rich industrial states in their own interest. (Sterling, 1972a)

Another set of international imbalances lay along the East–West axis. Although the Cold War formed the backdrop to the events that produced Infoterra, whether this backdrop signaled détente or ideological divide was unclear. The Soviet Bloc boycotted the 1972 UNCHE conference, primarily because the German Democratic Republic (GDR) had not been invited. However, Conference Secretary General Maurice Strong did meet with the Soviet ambassador to Stockholm multiple times during the conference to brief

him on proceedings. Moreover, the Soviet Union was an important donor to UNEP at that time, not only financially but also through the provision of political, technical, and human resources.

In 1977, UNEP hired the Soviet geographer Dr Sven Evteev as assistant executive director of UNEP. His efforts led to Moscow's hosting of the Infoterra Network Management meeting in 1979, under the auspices of the State Committee for Science and Technology of the Union of Soviet Socialist Republics (USSR). Two years earlier, the USSR's Council of Ministers had appointed a regional committee to coordinate environmental monitoring in COMECON countries (Aronova, 2015). Despite the appearance of Soviet participation in UNEP, however, longitudinal environmental survey data prepared by Soviet biologists for a key region of the USSR was not incorporated into the UN's Global Environmental Monitoring System (Aronova, 2015).

Rather than a truly "global" network, the original structure of the Infoterra system reproduced and reinforced the entrenched imbalance of the world economic situation. A 1981 analysis of Infoterra showed that information flow through the network was largely from North to South (Ruggie and Haas, 1981: 989). Countries from the industrialized world were still largely seen as information providers, while developing countries were imagined as the designated beneficiaries. Meanwhile, Soviet participation was held at the margins. At least in 1981, the dream of a new world information/communication order was nowhere being realized.

At its inception, the network functioned as follows: Upon invitation by UNEP, the government of a member state would designate a National Focal Point (NFP)—a major national agency with some kind of environmental responsibility. Each NFP was charged with identifying and registering a list of sources of environmental information from their jurisdiction. These sources were fed into an international directory, maintained initially in both looseleaf notebook format and in machine-readable format for computer use, and updated every 2 years (US EPA, 1975: 4). A source could be an organization, an individual, or a commercial operation; any organization that considered itself able to provide "a single coherent body of information concerning a single aspect of the environment" was deemed an appropriate source (US EPA, 1975: 2). Sources could be approached by the NFP or they could self-identify. In other words, no objective criteria were applied to select a source. This may explain, in the initial US directory of sources (US EPA, 1976), the preponderance of manufacturing and commercial companies in the chemical, steel, and electronics industries.

Sources filled out a 2-page form identifying their primary function and the nature and types of environmental information they could provide by choosing terms from a list of coded attributes, or keywords, prepared by UNEP (Martyn, 1981: 115–120). In the early years of Infoterra, there were approximately 1000 cross-referenceable keywords, grouped into 26 subject areas (Figure 2). Source registration forms were then sent to the computing center in Geneva and added to the international source file, which was compiled to create the Infoterra Directory.

To obtain information from Infoterra, users sent enquiries to their NFP, which would then reformat the enquiry as a coded search statement, using the same subject areas and list of attributes. The NFP then forwarded the query to the main office in Nairobi, which produced source listings ranked by relevance (i.e. keyword matches) and returned them

Atmosphere and climate	Pollution
Chemical & biological agents & processes	Population
Disasters	Recreation
Education, training and information	Renewable resources
Energy	Resources, supply, and use
Food and agriculture	Socio-economic aspects
Fresh water	Technology and industry
Geographic references	Transportation
Human health and well-being	Wastes
Human settlements and habitats	Wildlife – animal and plant
Land use and misuse	
Monitoring and assessment	
Management and planning	
Non-renewable resources	
Oceans, seas and estuaries	
Physical energy phenomena	

Figure 2. Alphabetical list of 26 environmental subject areas covered by Infoterra, 1981.

to the NFP, which edited the results and passed them back to the user. The onus was on the user to contact the sources listed on the results.[6]

Users (Figure 3) were imagined to encompass a range of stakeholders: "national and state government agencies, business and industry, university and research institutions, professional and special organizations and others concerned with environmental matters" (US EPA, 1975: 4; see also Cherfas, 1979). There was no cost to use the referral mechanism; but fees could be levied for the provision of documents (usually by mail).

Left entirely out of these manuals was any discussion of how and why these particular subject areas and attributes had been chosen, and how they might be interpreted. To give a single example of the complexity of the directories: The 1976 directory prepared by the US NFP (the newly created EPA) featured 104 pages of attributes, arranged alphabetically in two columns, with registered organizations corresponding to an attribute listed underneath. Under the subject heading Waste, for instance, is the attribute Waste Water Treatment. Seventy organizations are listed beneath, meaning that each of these organizations chose this attribute as one of multiple descriptors on their registration form. Of these, eight are EPA departments; 14 are state-level or municipal departments of health, water, or pollution control; 10 are universities; 16 are commercial or manufacturing corporations (including the Coca-Cola Company, the DuPont de Nemours Chemical Company and Sun Oil [Sunoco]); and the rest a hodgepodge of engineering consultants, risk management professionals, and laboratories.

By interpreting environment according to "stable" subject features and allowing public and private organizations to determine their own status within these features, the Infoterra leaders limited the benefits of the directory from the start. Moreover, it is unclear how this information would translate into different environments and especially to what extent its offerings would even be of use in other countries, countries with or

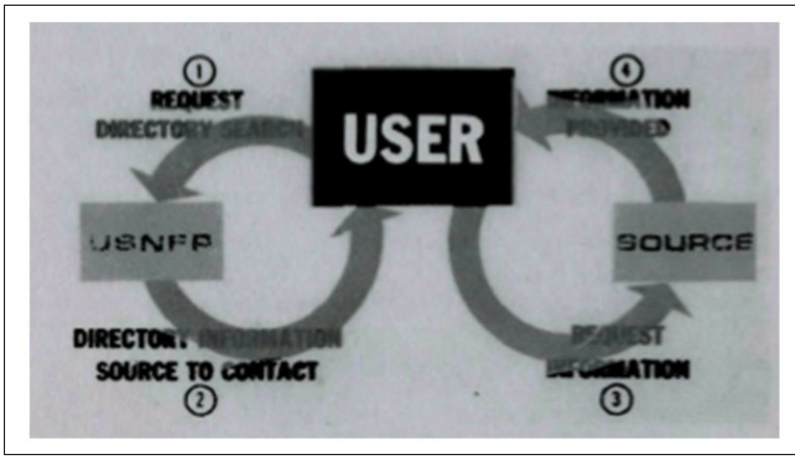

Figure 3. Visualization of Infoterra in action by the US National Focal Point (US EPA, 1976). The user (1) requests environmental information from the NFP, which (2) returns a source of information to the user. The user then (3) requests the information from the source, which (4) complies. Two completed circles.

without development needs. The discursive disposition adopted was that "the environment" was already a category of practice. This left out the potential for developing countries to participate in defining it on terms they could recognize.

Evaluating Infoterra: Communicating the global environment

Infoterra went "live" in 1977.[7] Two years later, the program's Governing Council requested an evaluation of Infoterra to assess its effects. A number of observations made by the evaluating team provide insight into how its organizers and early participants envisioned the system and, more significantly, the communication of environmental information.

First, like Infoterra itself, the evaluation of Infoterra was largely conducted as a cost–benefit analysis. So the main objective of the evaluation was not to assess the quality or accuracy of information about the environment, but whether the program was "worth" the financial investment made into it. Ironically, the number of people assigned to the international evaluation team, which included communications consultants, heads of NFPs, and academics, exceeded the number of staff running the program (Martyn, 1981: 4–7). However, an initial appraisal of the Infoterra network seemed promising: by 1981, when the evaluation report was published, Infoterra consisted of 110 NFPs, and a directory listing 8466 sources of information across 79 countries, making Infoterra more "networked" than almost any other international information service (Martyn, 1981: 73).[8]

On closer examination, however, the numbers were misleading. For many related UN agencies and their constituents, the Infoterra network was little more than a blip on their

radar. As the evaluator put it in his report, "Regrettably, the attitude of other parts of the UN family to Infoterra can best be described as apathetic" Martyn (1981: 69). UN agencies were already endowed with multiple information systems. Some of them, like the World Weather Watch overseen by the UN's World Meteorological Association, had since the 1960s adopted a far more effective network "system of systems" structure, building from existing national weather services rather than trying to create a new infrastructure from scratch, as Infoterra did (Edwards, 2010). It is possible that the better organized and better funded components of Earthwatch simply outshone Infoterra, or that interagency turf wars led UN higher-ups to ignore the Infoterra service.

This attitude seemed to extend to a number of NFPs in the system: 48% of the sources who responded to the evaluators' questionnaire indicated they were not even aware they had been registered as focal points in Infoterra. Crucially, this meant that users of the system were almost never sources themselves and vice versa, reinforcing the notion that environmental knowledge originated in one place and terminated in another.

Second, although in principle any organization could constitute an NFP, the evaluation revealed that virtually all of the NFPs were government bodies. Infoterra's claims to decentralization were seriously offset by the fact that high-level government officials retained authority over information distribution pertaining to the environment. Moreover, since the barrier to entry by sources was essentially non-existent (no criteria existed to qualify or disqualify sources, NFPs designated their own sources, sources could self-register), there was no oversight or quality control by the UN or any other independent authority.[9]

Third, despite the efforts to provide low-tech forms of access to facilitate developing country participation, the design of the Infoterra system reflected the technological conditions of industrialized nations (Martyn, 1981; Ruggie and Haas, 1981). As a decentralized network organized around referral, the system required considerable communication capacity at the outset, both in terms of domestic communication infrastructure and in terms of international infrastructure, as the source compilation relied on telex access to Geneva (Martyn, 1981: 13). In some cases, it took approximately 40 days for substantive information to travel through the network, owing to limited access to photocopiers, printers, and microfiche readers; lack of funds for telephone communications; and weak postal systems in developing countries (Martyn, 1981: 43; Ruggie and Haas, 1981).

The problem was exacerbated by the location of the UNEP agency in Nairobi. UNEP was the first UN entity to be located in a developing country (Haas, 1995). Aside from a symbolic statement, there were few advantages to this location. Without the technological infrastructure to support a communications network, the putative goal of inciting national self-reliance was impossible. As Ronald Huch (2015) describes,

> Locating UNEP/GEMS in Nairobi created serious logistical problems in getting the monitoring system under way. The expertise of support personnel was not sufficient to keep the operation functioning properly. Frequent breakdowns in energy supply, common in developing countries, reduced efficiency. Computer malfunctions, meanwhile, were not as quickly rectified as they would have been in an industrial state.

To the extent that Infoterra was designed to stimulate environmental awareness, the assessors noted that the system had had some impact. Some countries reported increased

requests for environmental information, the establishment of contacts leading to environmental information communities, and greater awareness. However, as the evaluator quietly pointed out, the continued lack of environmental awareness in some countries was due not to lack of concern about environmental problems, but to the fact that

> such problems take second place to more urgent problems of simple survival; faced with widespread poverty or hunger, or a failing economy, or other problems requiring urgent short-term actions in the interests of survival, longer-term considerations necessarily take second place. (Martyn, 1981: 62)

This reality undercut the "informational globalism" promoted by the UN Earthwatch program (Edwards, 2010; Hewson, 1999).

Infoterra 1992–2003

By its 15th birthday, on 15 December 1992, Infoterra could claim some success. UNEP produced promotional pamphlets for journals like *Information Development* (1993) showing year-over-year increases in queries as well as NFPs, including NFPs from developing countries (see also Lee, 1989). UNEP also created a booklet, *Infoterra: 15 Years of Making a Difference* (UNEP, 1992), meant to document "success stories" of information access across environmental problems and geospatial arenas, with problems seen as contained, actionable, and resolvable. One promotional text sought to make clear the benefits of participating in Infoterra for the international community:

> Few environmental problems are new problems. However unique to a particular region or country a particular problem may appear to be, the chances are that somewhere else on the planet the same problem has already been addressed, research conducted, results analyzed, and solutions found. The benefits of the Infoterra network are the benefits of sharing: the exchange of information about solutions, the saving of duplicated effort and the time-consuming search for the right answers. (UNEP, 1993)

The pamphlet also sought to mitigate the fact of persistent unequal information flow between North and South, suggesting, "The transfer of information is seldom a one-way street. Apart from the global environmental benefits of information sharing, there may be direct economic benefits for both developed and developing countries" in the Infoterra network (UNEP, 1993).

Other aspects of the network still foundered. Terminology, for instance, was a huge problem. How could a term like "organic pollutants" or "mutagenesis" be transposed and made meaningful in a country with entirely different environmental conditions? In 1992, the program launched a Thesaurus of Environmental Terms to try to mitigate the problem, revising and expanding it in 1997, so it was printed in the six official UN languages (English, French, Spanish, Russian, Chinese, and Arabic) (Ingraham, 1997). The development of thesauri as a means not only to organize a scientific lexicon but also to foster international collaboration around environmental issues dates back to at least 1972, when attendees at the International Geological Congress presented a draft of a thesaurus on the geosciences (Rassam et al., 1988); UNEP itself contemplated developing an environmental

thesaurus in 1977 (UNEP, 1977; UNEP, 1997). In principle, developing region-specific vocabulary or translating terms into other languages can represent a useful attempt to demonstrate the family resemblance of environmental concerns across geographic areas. In practice, however, the development of the Infoterra thesaurus mainly served to reproduce the basic assumption of the network: to apply an information-based solution to what was fundamentally a cultural, political, and economic problem.

By 2003, Infoterra received barely a mention in the UNEP's Annual Report. In the 2004 annual report, it was entirely absent. There are obvious reasons for Infoterra's disappearance, the information possibilities of the Internet among them. But other reasons deserve mention: the prevalence of existing EISs in industrialized nations, the apathy of the rest of the UN system, and the concurrent rise of business interests and trade associations in shaping what counted as environmental problems (Conley, 2006).

Infoterra demonstrates a key feature of EISs: they are always products of not just environmental politics but information politics as well (Fortun, 2016). Claims that information provision and communication exchange constitute automatic goods require close analysis to uncover the empirical conditions that either enable or inhibit these goods. As an ostensibly global and decentralized information network, Infoterra was meant to symbolize the possibilities of borderless, networked communication. By creating a technical infrastructure for information exchange, the objective was to draw nations into a globally shared environmental consciousness. At the same time, by offering access to practical information about environmental problems, international decision-makers argued, national governments—especially in developing countries—could develop the collective self-reliance required to take the reins of their own environmental burden. But without the political or economic scaffolding for either global cooperation or national self-reliance, Infoterra was destined to teeter on the margins of awareness. Infoterra appears more as the result of short-term, cost–benefit analysis, allowing industrialized countries to avoid making serious concessions in either their domestic or their international environmental policies.

The case of Infoterra allows us to rethink some assumptions about the role of environmental information systems as global media. The "informating" of environmentalism affects what counts as global as well as what counts as scientifically accurate (Fortun, 2016). EISs mediate the very methods we deem acceptable to produce data and predict environmental phenomena and the means by which we observe and interpret environmental change. Hulme (2015) argues that our current understanding of climate as a "calculable and predictable physical interconnected global system" aligns knowledge with power and forces a global consensus around this knowledge. This global consensus inherently underprivileges developing countries since the calculations take place in the developed world.

Clearly, Infoterra is a reflection of these knowledge and power dynamics. My research suggests that Infoterra did emerge from a genuine desire by diverse players to help least developed countries (LDCs) gain self-reliance. But maybe this was the problem at the outset. The gulf between conception and practice may lie in the impossibility of actual self-reliance in the context of the international economic order and its ongoing structuring of resources in the developing world.

At the same time, Infoterra is a product of the knowledge/power dynamics of the UN more generally, and this renders it a somewhat more ambivalent project. It is possible that the ultimate moral of this story resides in the clash between ongoing struggles with uneven development and the way that the idea of the "global environment" was managed in Stockholm and after. As Ingold (2000) has observed, the current notion of the global environment has moved us toward a conceptualization "which places nature on the inside and humanity on the outside" (p. 155). The image of the global environment embodied at Stockholm was technological, scientific, and above all "manageable" (Höhler, 2015). Its administration became a product of uneven development "realities," from political obstacles in international negotiations to bureaucratic obstacles within the UN. As Höhler (2015) points out, "The peculiar term 'human environment' that set the agenda for the conference illustrates how nature as detached and apolitical dissolved in the global political field of environment and development" (p. 13).

"Basic environmental problems need not go unaddressed for want of the right information," wrote EPA administrator William K. Reilly in an April 1992 EPA pamphlet called *Environmental Technology Sources: Matching Solutions to Problems*. Rather than "serve as an international liaison between those who are seeking environmental information and those who have the knowledge and expertise," as the EPA pamphlet claimed, Infoterra reproduced limited conceptions of both information and expertise, along with a shrunken sense of what constituted an environmental "problem" and how to communicate it in a weakly interconnected "global environment."

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Notes

1. Agent Orange refers to the use, by the US military, of the chemical product codenamed "Agent Orange" to eliminate forest cover and crops during the Vietnam War, causing severe human health problems. See the resources of the War Legacies Project at http://www.agentorangerecord.com/home/.
2. Recent analyses claim that few of the recommendations were put into place, since the Action Plan was not legally binding (Roberts and Peter, 2016: 5). However, the recommendations pertaining to information appear to have been taken more seriously than others.
3. Other environmental information systems established under Earthwatch in the 1970s include the Global Environment Monitoring System (GEMS) and the International Register of Potentially Toxic Chemicals (IRPTC). In 1985, another EIS called Global Resource Information Database (GRID) was added. For details on the ambit of these systems, see http://

www.un.org/earthwatch/about/docs/annrpt92.htm. For a discussion of their role in advancing Cold War paradigms of surveillance and international monitoring, see Boudia (2014).

4. At its inception, the information network was known as the International Referral System (IRS). Subsequent confusion over the use of this acronym led to the renaming of the system as Infoterra in January 1979. I refer to Infoterra here for the sake of narrative continuity.
5. For a perspective from the United Kingdom on Infoterra's role in British, European, and international environmental information management, see Peachey (1974).
6. Within a few years, Infoterra expanded its purview to include substantive information.
7. The US National Focal Point was launched 2 years earlier, on 6 October 1975, amid some fanfare and speeches by representatives from UNEP, the EPA, the US State Department and the US Department of Interior. See UNEP (1975), "Opening of UNEP/IRS National Focal Point."
8. The only two information services larger than Infoterra at this time were the United Nations Industrial Development Organization (UNIDO) Industrial Information System and the World Weather Watch. See Martyn (1981: 73).
9. In a number of cases, the registered source of information was in fact a public relations unit devoted to promoting its own organization's information.

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