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Earthwatch 25 Years On: Between Science and International Environmental Governance

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EARTHWATCH 25 YEARS ON: BETWEEN SCIENCE AND INTERNATIONAL ENVIRONMENTAL GOVERNANCE

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Contents

Figures

Abstract

The UN system is complex and its workings often seem muddled to the outside observer. This is a problem the UN has struggled with from its inception, sometimes successfully but often not. Part of the difficulty lies in the increasing complexity of issues being addressed internationally, including not least `sustainable development'. The expectations raised by such an all-encompassing term are hardly achievable in immediate terms. This lack of clarity in the issues addressed through the UN is also reflected in its institutional structures. The story of Earthwatch is just one example of how the UN has attempted to bring clarity into its system. In this case the aim was to bring together the most up to date scientific knowledge and make it policy relevant on an ongoing basis. What seemed a relatively straightforward goal instead has been fraught with difficulties. This analysis looks at these difficulties in terms of the relations between science and policymaking. The paper observes that there have existed three distinct conceptual approaches to this relationship: the functional approach; the feeder of information approach; and the assessments for policy approach. Each has had a decisive influence on the practice of Earthwatch. The paper concludes that the most recent approach offers the best alternative to realizing Earthwatch's goal. However, especially now much work remains to be done. To this end, a suggestion for further research is offered.

Acknowledgments

Acronyms

A	United Nations General Assembly - used in publications codes
CELIB	Environmental Legal Instruments Database (UNEP)
CSD	Commission on Sustainable Development
DOEM	Designated Officials on Environmental Matters
E	Economic and Social Committee of the United Nations (ECOSOC) – – used in publications codes
EWWP	Earthwatch Working Party
FAO	Food and Agricultural Organization of the UN
GA	United Nations General Assembly
GAW	Global Atmosphere Watch
GCOS	Global Climate Observing System
GEMS	Global Environmental Monitoring System
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Pollution
GOOS	Global Oceans Observing System
GOS	Global Observing System
GRID	Global Resources Information Database
GTOS	Global Terrestrial Observing System
IAEA	International Atomic Energy Agency
ICSU	International Council of Scientific Unions
IIASA	International Institute for Applied Systems Analysis
IIED	International Institute for Environment and Development
IMO (IMCO)	International Maritime Organization (formerly International Maritime Consultative Organization)
INFOTERRA (IRS)	UNEP's Global Environmental Information Exchange Network (formerly Information Referral Service)
IPCC	Intergovernmental Panel on Climate Change
IRPTC	International Register of Potentially Toxic Chemicals
NOAA	National Oceanographic and Atmospheric Administration
PAC	Programme Activity Centre (UNEP)
RAINS	Regional Air Pollution Information Simulation (IIASA)
SCOPE	Scientific Committee on Problems of the Environment
SWMTEP	System-Wide Medium Term Environmental Programme
UNCED	United Nations Conference on Environment and Development
UNCHE	United Nations Conference on the Human Environment
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
WMO	World Meteorological Organization

EARTHWATCH 25 YEARS ON: BETWEEN SCIENCE AND INTERNATIONAL ENVIRONMENTAL GOVERNANCE

By Jan-Stefan Fritz[*]

INTRODUCTION

The overall aim of this paper is to contribute to a better understanding of the relations between the pursuit of international environmental governance and the role of scientific enquiry in this. Of particular interest here are the relations between the conceptual underpinnings of this relationship and their implementation in the real world. In practice, the UN system is the only network of bodies responsible for monitoring and assessing the state of the environment world-wide as well as providing a forum for international governance. Monitoring is generally used to describe scientifically designed and continuing observation and/or measurement of given indicators or environmental variables in accordance with a fixed schedule in space and time.[1] Assessments, in turn, constitute a sphere of knowledge production whereby `value' is added to data with a view to having policy relevance.[2] Together monitoring and assessment are the mainstay of most international science projects.

In 1973, the United Nations Environment Programme (UNEP) introduced Earthwatch, as a means of coordinating and acting as catalyst for all environmental monitoring and assessment projects throughout the entire UN system. The *raison d'être* was and remains to provide `integrated' information gathered from across the UN system relevant for policymaking. In practice, Earthwatch has instead faced ongoing difficulties and has been reconstituted several times as a result. In this light, the key question to be answered here is why have such difficulties been faced defining and implementing Earthwatch?

Part I is a history of the development of Earthwatch from its creation up to mid 1997. Part II follows with an analysis of the theoretical underpinnings of the Earthwatch concept and its practice. The aim is to shed light on the problem of reconciling particular conceptions of science and their respective relations to policymaking. This is considered

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[1] Adapted from a definition by Branislav Gosovic, *The Quest for World Environmental Cooperation: The Case of the UN Global Environmental Monitoring System*, London: Routledge, 1992, p.36.

[2] This definition was given by Arthur Lyon Dahl during a meeting in Geneva on 8 August 1997.

in terms of the juncture between the substance of Earthwatch's work, to coordinate the collection of data and to formulate assessments, and its purpose, to inform decision-makers. In taking this focus, this paper does not consider in details exactly when and how one group influenced another. Instead the focus is on the institutional structure that is seen to frame this interaction.

This paper seeks to make several contributions. First, it contributes to the ongoing debate about UNEP's future. While many articles have been written about UNEP, few consider Earthwatch in detail.[3] Moreover, those that do exist are either out-of-date and/or do not consider both empirical and theoretical contexts. As well, this paper is also a response to Branislav Gosovic's observation that Earthwatch depicts one of UNEP's basic functions and is embedded in an "inherently ambiguous structure and practice … about which little has been written."[4] This paper is written in the belief that conceptual frameworks are central in shaping international cooperation. Making these frameworks explicit is important as a means to better understanding and ultimately building institutions to foster longer-term international cooperation. Finally, this paper points toward further research which is necessary for improving the capacity of the United Nations system to draw on the widest possible resources to better understand and ultimately reconcile human development and environmental change.

I.
EARTHWATCH: A BRIEF HISTORY

i. THE CONTEXT AND CONCEPT:

In the 1950s and 60s, numerous projects were initiated to better understand and sometimes protect the natural environment. Many of the globally oriented efforts were sponsored by agencies of the UN system. Their work principally involved monitoring environmental indicators and in individual cases providing assessments thereof. Some of the most prominent efforts include the Background Air Pollution Monitoring (BAPMON) network founded by WMO in 1968, the Global Network Isotopes in Precipitation founded by IAEA in 1958, and the International Hydrological Decade sponsored by UNESCO from 1965.[5] Between these and the other myriad projects there existed no formal coordinating mechanism or means of cooperation. Interestingly,

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[3] For an article which exclusively addresses sustainable development related coordination in the UN and refers to Earthwatch only once, without explanation, see Reg Henry, 'Adapting United Nations Agencies for Agenda 21: Programme Coordination and Organizational Reform,' *Environment* (V.5, N.1, Spring 1996) pp.1-24.

[4] Gosovic, *op. cit.* in note 1, p.xviii.

[5] For a slightly out-of-date, yet comprehensive list of monitoring and assessment programmes see UNEP-HEM, *A Survey of International Monitoring and Assessment Programmes of International Organizations (Ed. 3.4),* available via internet at www.gsf.de/UNEP/blue1.html.

though, despite the fragmentation, remarkable similarities can be seen in the type of programme being developed. Many of these were characterized by being closely linked to technological developments including in particular, but not exclusively, satellite observation and other advanced monitoring systems.

The United Nations Conference on the Human Environment, or Stockholm Conference, of 1972 drew on this tradition. Its preparatory process gave priority to monitoring and assessment related issues, especially in negotiations about future institutional arrangements. In late 1971, the UN Advisory Committee on Coordination produced a list of substantive matters to be addressed by any new organization. The main points coming out of this document were that an organization was to be developed which would coordinate existing programmes of the UN system and provide the means for obtaining the "best available objective knowledge … for rational decision-making."[6] Based on this document and the preparatory process as a whole, a report was released by the Secretary General of the Conference, Maurice Strong, on the `International Organizational Implications of Action Proposal.' In the report, Strong suggested that any new organization must follow what he called a `form follows function' approach.[7] Thus instead of proferring specific institutional structures for a new organization, he focused on defining the functions which had to be accomplished and the means necessarily involved in realizing these. The functions to be pursued included knowledge acquisition and assessment, environmental management; prevention and settlement of disputes; and support actions to help countries to realize especially the first two functions. The means to these `ends' was to be principally a task of coordinating existing national, regional and international activities. Specific institutional structures, in turn, were seen to emerge as a direct reflection of the action being taken. For example, if water pollution was being considered, then hydrologists and sanitation experts would be consulted, but not government officials. The annex to Strong's report stated that "the highest priority should be attached to the need for coordination and rationalization of continuing and planned international environmental activities."[8] Moreover, it stated that such efforts need be flexible and evolutionary so as to adapt to changing circumstances. No new specialized agency or large-scale international organization was envisaged. Most industrialized states, in particular, did not want more agencies, but wanted activities to be coordinated. The specialized agencies, in turn, wanted no meddling in their activities. Developing states in turn wanted a much broader mandate including development-related issues such as natural resource monitoring. Equally, having just gained their independence in many cases, the governments of developing states were on average not keen to relinquish their newly gained authorities. Thus UNEP's establishment was the result of a compromise. UNEP was given an open-ended and vague mandate which, it was expected, would evolve over time. In the meantime, the responsibility of

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[6] A/Conf.48/12 of 17 December 1971 entitled, 'Consolidated Document on the United Nations System and the Human Environment,' paragraph 111.

[7] A/Conf.48/11 of 10 January 1972 entitled `International Organizational Implications of Action Proposals,' paragraph 6.

[8] A/Conf.48/11/Add.1 of 10 January 1972 entitled `International Organizational Implications of Action Proposals, paragraph 58. 'This document is an extract from A/Conf.48/PC/17, Chapter III.

environmental protection remained primarily with national governments and in conducting any activities UNEP was to be "mindful of the sectoral responsibilities of the organizations in the UN system.[9]

ii. INSTITUTIONALIZING ENVIRONMENTAL ASSESSMENT: 1972-1979

In line with UNEP's open-ended mandate, the breadth of responsibilities it was expected to take on was quite ambitious, if only as defined on paper. The Stockholm Action Plan, which provided the basis for UNEP's work, reflected this. Its recommendations were separated into three `functional components': environmental assessment, environmental management, and support measures. The latter two components encompassed the structural and administrative activities necessary to support environmental protection in the broadest sense. Environmental management, for its part, was designed not to manage the natural environment but the related institutional arrangements. This component was to act as substantive support unit with the capacity to (co-)sponsor international conventions, develop `action plans', and promote the use of soft law. Action plans are frameworks for action aiming to build scientific consensus and political support. Soft law is the implementation of non-binding agreements. The support measures component was designed to encompass everything from education and manpower training to public information and financial assistance.

The most important aspect of UNEP's work was seen to be its environmental assessment component. Assessment was defined as:

> the means to carry out research, to monitor (*i.e.,* observe and measure), and evaluate the data thus obtained in order to establish facts and trends, to increase knowledge and forecasting capabilities, and to arrive at scientific conclusions that will be relevant and useful for decision-making and management.[10]

In an interview following UNEP's establishment Maurice Strong, who had by then been appointed its Executive Director, stated that indeed "objective assessments [had to be provided] on a nonpolitical level to point up alternatives as a basis for action at the political level."[11] It follows that UNEP's `functional' work, being substantive and objective, would implicitly provide priorities upon which the policy-making community would act automatically.

At UNEP's first Governing Council meeting assessment was given institutional shape as four `functional' areas:[12] monitoring environmental indicators, disseminating

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[9] A/Res/27/2997 of 15 December 1972 entitled 'Institutional and financial arrangements for international environmental cooperation,' paragraph six.

[10] A/Conf.48/14/Rev.1, no date or title available, paragraph 6.

[11] Sally Jacobsen, `Maurice F. Strong: Stockholm - A Year Later,' *Science and Public Affairs / Bulletin of the Atomic Scientists*, (V.29, N. 6, June 1973) pp.38.

[12] The term functional is used throughout UNEP documents as well as in papers about UNEP. See, for example, Brian Martin and Francesco Sella, `Earthwatching on a Macroscale,' *Environmental Science and Technology* (V.10, N.3, March 1973) pp.230.

information, research, and evaluating and reviewing the state of the environment.[13] Together these areas became known as `Earthwatch' *(See Figure 1).* Earthwatch was

FIGURE 1: EARTHWATCH IN UNEP, 1970s
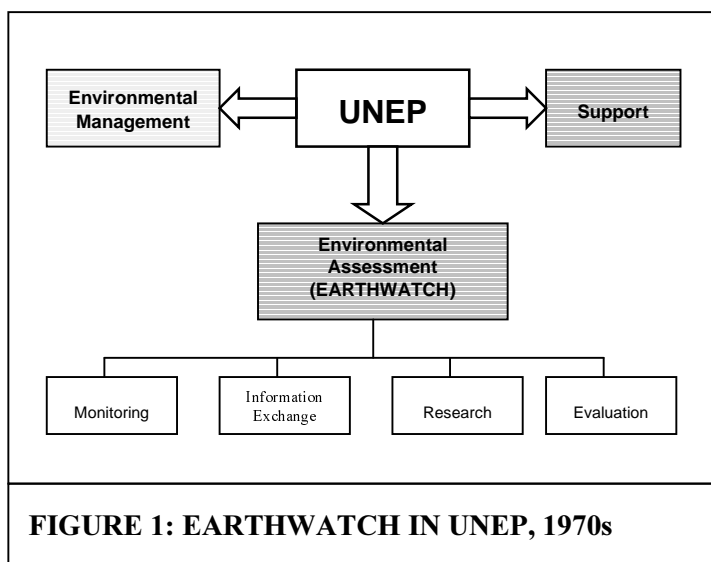
defined as being a "dynamic process of integrated environmental assessment by which relevant environmental issues are identified and necessary data are gathered and evaluated to provide a basis of information and understanding for effective environmental management."[14] Within the scope of these areas little specific mention was made of specific day-to-day working arrangements. Adding to this potential difficulty a debate broke out about the term `Earthwatch'

which came under heavy criticism from developing states and specialized agencies. In short time it was dropped in favour of `UNEP Environmental Assessment programme'. The main criticism levied by developing states was that their interested were not reflected in the Assessment programme's agenda and therefore to call it `Earthwatch' was deemed too delicate. Developing states were particularly anxious to have the support component strengthened. The specialized agencies, in turn, objected to Earthwatch as part of their criticism of UNEP as being the lead institutional arrangement for environmental protection.[15]

During the 1970s, the Environmental Assessment programme crystallized around three main components known as Programme Activity Centres (PAC).[16] The first PAC to be established was INFOTERRA (originally named Information Referral Service) in 1972. Its mandate was to identify and aid in the exchange of sources of environmental expertise and information. The second PAC was the International Register of Potentially Toxic Chemicals (IRPTC), established in 1976 both as a clearinghouse on noxious

[13] For a more elaborate discussion of these components than is available in the Action Plan, see A/Conf.48/12 of 17 December 1971, entitled 'Consolidated Document on the United Nations System and the Human Environment,' submitted by the Administrative Committee on Coordination.

[14] UNEP/GC/61, date and title unknown, paragraph 231.

[15] For more detail, see UNEP/EWWP2/WP.2/rev.1 (Annex 1) of 6 April 1995, written by C.C. Wallen, `Development of the Concept of Earthwatch since 1972,' *UN System-Wide Earthwatch Programme Document*.

[16] Other PACs exist outside of the Environmental Assessment programme, including the Oceans and Coastal Areas PAC which falls in the management component and is responsible for coordinating the thirteen Regional Seas Programmes. As part of its support component, UNEP also established the Industry and Environment PAC in 1975 and, as part of Environmental Management, the Desertification Control PAC.

chemicals and to promote national-level chemical management and assessment programmes. Both these components, however, were secondary in terms of scope and ambition to the Global Environmental Monitoring System (GEMS). Given the extensive Stockholm conference preparatory work that existed as well as statements by Strong it was clear that monitoring would become a major aspect of UNEP's work even before its founding.[17] UNEP's first General Council session in fact begins to set out a programme for environmental monitoring – the only defined component of `Earthwatch'.[18]

After substantial negotiations, member states of the Governing Council voted in favour of a monitoring system at their second session in March 1974.[19] Details in the GEMS resolution are vague, but the main aim was to develop a comprehensive global system of monitoring and assessment activities to improve scientific knowledge and the understanding of environmental processes. In practice, initial opposition to UNEP and the idea of Earthwatch had substantial repercussions on the operational work of GEMS. Instead of being a system-wide and substantively comprehensive, GEMS cooperated with only certain organizations depending on the sectoral activity it was working on. This situation was perhaps largely determined by the extremely vague resolution of 1974 which gave GEMS neither a mission statement nor formal objectives. This meant that over time GEMS focused on developing sectorally based programmes, rather than becoming the envisaged coordinating umbrella. The most important areas of activity include (with partner organizations) health related monitoring (WHO), urban air pollution monitoring (WHO), food quality (WHO with FAO), freshwater quality (WHO with FAO and UNESCO) and environmental radiation (WHO).

In 1975, at the third Governing Council Session, the mandate of GEMS was broadened to encompass both monitoring and assessment capacities. This situation was formalized when in 1979 the Director of GEMS/PAC also became Acting Director of Environmental Assessment. Accordingly, in terms of UNEP's activities GEMS became increasingly important. While this was seen as an important step toward the reality of developing `Earthwatch' in practice, it also *de facto* meant that GEMS became a surrogate Earthwatch.

During the late 1970s the first critiques of UNEP's progress began to emerge. One of the first critiques of UNEP in the academic literature came from Richard Sandbrook of the International Institute for Environment and Development (IIED).[20] UNEP on the

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[17] When asked about Earthwatch in an interview Strong refers only to the monitoring aspect. See Jacobsen, *op. cit.* in note 11, p.37.

[18] UNEP/GC/1/Res.1 of 1973 entitled 'Action plan for the human environment: a programme development and priorities.'

[19] UNEP/GC/A/9625 - 8(ii)II.. Interestingly, the specialized agencies voiced similar complaints about GEMS as they had about Earthwatch and, for that matter, UNEP in general. Their main complaints were that GEMS would encroach on their territory and, more broadly, UNEP was too small to be responsible for such a complex activity. See Gosovic, *op. cit.* in note 1, p.48.

[20] One year earlier Clayton E. Jensen, Dail W. Brown and John A. Mirabito published an analysis of Earthwatch without, though, delving into a formal critique of it in `Earthwatch,' *Science* (V.190, October 1975) pp.432-38.

whole was faltering he argued, but then commented that "Earthwatch is, in fact, the only significant functional task that UNEP is involved in apart from its conference support work".[21] A few years later, the general feeling seems to have been that UNEP's position was improving in the UN system, but its programming was beginning to show substantial difficulties. The specialized agencies were no longer as critical of UNEP as earlier; one might assume that because its budget was so small, UNEP in no way posed a threat or even had the ability to meddle in other programming. UNEP's programming, in contrast, came under increasing criticism for being too broad-brushed and not having enough direct impact. Some of this criticism reflects UNEP's difficulties in implementing the Stockholm's outcomes, which were in any case considered by many to be too broad.[22] Though monitoring was rated favourably overall, many specific projects failed or fell short of expectations.[23] As independent observer Erik Eckhholm concluded: "even tasks that once seemed straightforward, such as global monitoring of trends in pollution and living resources, have turned out to be complex and expensive. Of countless possibilities, just what shall be monitored, for what purpose, and at what cost?"[24] Especially GEMS was seen to have some problems both with its substantive work and in its relative position within UNEP and *vis-à-vis* other organizations. On the substantive side, GEMS was limited by science and technology, both intellectually and physically. The limits of technology, incomplete scientific understanding of processes, high capital and operating costs of monitoring, a lack of harmonized scientific methods and structures as well as inadequate funding and support from national governments all contributed to UNEP's problems. Concerning funding, for example, despite the importance of GEMS to UNEP, total funding remained small throughout the 70s and onward.[25] Intellectually, it was limited insofar as it reflected a very narrow type of monitoring, ignoring more non-technical sources and means of gathering information. Most importantly, however, GEMS suffered from a lack of proper objectives for what was to be achieved. That is, what exactly was to be achieved by monitoring the

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[21] Richard Sandbrook, `Two steps forward, one step back,' *Nature* (V.261, 20 May 1976) pp.179-180. For reasons that are uncertain to me at the moment, the Sierra Club and Ågesta reports of 1982 also both placed Earthwatch at the top of their lists in terms of success of individual activities within UNEP. See John McCormick, *Reclaiming Paradise: the Global Environmental Movement*, Bloomington: Indiana University Press, 1989, Table 2.

[22] For a more recent discussion on the Stockholm Declaration as being `UNEP's gravest weakness' due to its `ideological inadequacy' and lack of `true vision' see Mark A. Gray, `The United Nations Environment Programme: An Assessment,' *Environmental Law*, (Vol. 20, N.1, 1990) pp.310-312.

[23] In 1982 the Ågesta Group of Sweden and the Sierra Club published analyses of UNEP's progress, based on a priority list of twenty goals to be achieved by 1982 agreed to by the UNEP Governing Council in 1977. For summaries of these two studies see McCormick, *op. cit*. in note 21, p.123.

[24] Erik P. Eckholm, *Down To Earth: Environment and Human Needs*, New York: W.W. Norton and Company, 1982, p.5.

[25] Funding has varied greatly over the years. In its first year, the Environment Fund allocated a mere 5.5% of its total budget to GEMS; a figure which rose to 21.8% in 1990-91. In total, though, the Environment Fund increased from only $5.5 million in its first fiscal year to $68 million in its final year before UNCED; small amounts on almost any comparable scale.

environment? Or, how to was the collected information to be evaluated? In their review academics Robin Clarke and Lloyd Timberlake echoed the above critiques, though they also saw GEMS as one of UNEP's more useful and potentially successful efforts.[26] Similar criticisms were also voiced by NOAA scientists Clayton Jensen and Dail Brown, who saw both GEMS and INFOTERRA as potentially useful though having problems.[27] In addition, they observed that the areas of `research' and `evaluation' continued to be non-existent, and, most importantly for purposes here, they also observed a lack of an overarching institutional framework.

iii. FROM REVIEW TO REVIEW: 1979-1992

The failure to establish a system-wide environmental monitoring and assessment programme was among the most important concerns for UNEP in asserting its position. Therefore in light of the criticisms, a Group of Experts was established in 1979 to consider possible mechanisms and procedures for environmental assessments within a functionally operational system-wide Earthwatch – interestingly the term was still being used informally to refer to the UNEP Environmental Assessment programme. The Group published its report in 1981.[28] Beyond (re)analysing what constitutes assessments, concluding that GEMS' assessments were not `comprehensive'[29] and offering suggestions for related improvements, the Group did not consider in detail the necessary institutional structures for realizing a day-to-day, working system-wide Earthwatch. The belief, as in 1972, seems to have been that assessment structures would develop `naturally' once GEMS was in place and enough data was collected. In a slight change of pace, and unlike earlier definitions of assessments, this report does refer to the importance of economic and social information.

UNEP's most substantial response to criticisms, however, was releasing its first larger-scale state of the environment report in 1982. Entitled *The World Environment: 1972-82*, the report's aim was to provide a thorough review of environmental change and the state of knowledge. [30] Interestingly, though it ranks among the most thorough analyses of changes in the physical environment and corresponding sectoral institutional structures to that day, it does place itself in an ongoing context. It was a

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[26] Robin Clarke and Lloyd Timberlake, *Stockholm Plus Ten*, London: Earthscan, 1983.

[27] Clayton E. Jensen and Dail W. Brown, `Earthwatch – Global Environmental Assessment,' *Environmental Management* (V.5, N.3, May 1981) pp.225-232.

[28] UNEP, `Earthwatch: An In-Depth Review,' *UNEP Report No.1*, 1981.

[29] A `comprehensive assessment' was expected to include: a description of the problem; a review of available knowledge; the establishment of the significance and priority of the problem; effects or impacts assessments; a description of the available technology and methods for control/management; a description of knowledge gaps and further research; an analysis of socio-economic consequences; as well as conclusions and alternative courses of action for policy-makers. See *ibid*., paragraph 5.

[30] UNEP, *The World Environment 1972-1982*, Martin W. Holdgate et. al. (eds.), Tycooly International for UNEP, 1982.

`one-off' report. According to the criteria of what constitutes a `comprehensive' assessment established a year earlier, this did not fulfil expectations. For one thing, the report did not consider alternative courses of action for policymakers. This point has particular salience given the authors' statement that "the changes in the nature and scale of impact on the physical environment in the past decade may have been less important than the parallel changes in human institutions and perceptions."[31]

The problem was that despite the release of a substantial report, it still had not moved toward establishing a more systematic, ongoing monitoring and assessment programme. Given the failure to establish Earthwatch, the concept seems to have almost disappeared from use during the 1980s. Until the early 1990s UNEP's Environmental Assessment programme thus effectively consisted of individual monitoring as well as information management and dissemination activities.

The UNEP Environmental Assessment programme's most substantial step during the 1980s was to establish the Global Resource Information Database (GRID) as part of GEMS in 1984. As a georeferenced, computerized database GRID was designed to be the data management side of GEMS. In particular, it was to improve the state of and access to GEMS databases, standardize all stored data as well as counter the physical (geographical) and technological (hard- and software) separation of databases. More importantly, GRID represented not only a task expansion for UNEP, but also its first internal, functionally operational activity. Although UNEP was not mandated to develop its own internal programming, it did exactly that in several instances; perhaps most prominently in the Regional Seas Programme and, on a much smaller scale, also INFOTERRA. The importance of GRID was that it represented a first attempt by UNEP to establish a programme which aimed to coordinate activities, not just administratively, but functionally, as well as having an appropriate institutional structure. Over time, GRID became increasingly successful relative to other UNEP projects. Not least, this prominence can be seen in its budget. In its first two years of operation GRID received $5.35 million from the Environment Fund; thus making it the best endowed GEMS programme.[32] Moreover, it was entirely internally financed, with no cooperative partners. With GRID becoming larger, both in substantive and institutional terms, it was upgraded to PAC in 1991.

The Earthwatch concept did not reappear until the UN General Assembly passed two resolutions reiterating its importance toward the end of the decade. In 1989, a resolution was passed regarding international cooperation with a view to environmental emergencies[33] and in 1990 Earthwatch was referred to in the second System-Wide Medium Term Environment Plan (SWMTEP) document.[34] SWMTEP was established in the mid-1980s to provide a conceptual framework for coordinating the environment-related work of the UN system. However, given the lack of partners in the latter's case

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[31] *Ibid.*, p.14.

[32] Gosovic, *op. cit*. in note 1, p.195.

[33] A/Res/44/224 of 22 December 1989 entitled 'International cooperation in the monitoring, assessment and anticipation of environmental threats and in assistance in cases of environmental emergencies.'

[34] A/Res/45/253 of 21 December 1990 entitled `Programme planning.'

and the vagarious of what constitutes environmental emergencies in the former's, none of these efforts produced concrete institutional outcomes. Reflecting UNEP's continuing aspiration to create Earthwatch, Executive Director Mostafa Tolba stated in 1990 that "UNEP is [still] striving to coordinate monitoring and assessment capacities."[35]

iv. REVITALIZING EARTHWATCH? FROM 1992 ONWARD

For Earthwatch, the 1992 United Nations Conference on Environment and Development represented another turning point. Given the state of the international political climate of the time, the role of science was conceived of in terms quite different from 1972. In very brief terms, the increasing importance of development activities, the end of the Cold War, as well as changes in political discourse including debates about democratization and environmental ethics meant that science was no longer perceived of being such important. This was reflected in Chapter 40 of Agenda 21 which addresses the role of (scientific) information in (political) decisionmaking.[36] Chapter 40 is devoted entirely to this theme, and thus specifically also to questions of monitoring and assessment. [37] Broadly, the chapter sets two priority areas which remain central to Earthwatch to this day. First, the need to bridge what is called a `data-gap', and second, how to improve information availability. Concerning the data-gap the aim was to move beyond the patchy network of data collection, assessment, management and dissemination:

> Within the organs and organizations of the United Nations system and relevant international organizations, data-collection activities, including those of Earthwatch and World Weather Watch, need to be strengthened, especially in the areas of urban air, freshwater, land resources (including forests and rangelands), desertification, other habitats, soil degradation, biodiversity the high seas and the upper atmosphere.[38]

Chapter 40, it is worth noting, also proposed founding a Development Watch, under the auspices of UNDP, to run in parallel to Earthwatch.

Concerning the dissemination of information to decisionmakers, little was written despite this area's more wide-ranging implications. Chapter 40 did not go beyond expressing a desire to make more information available; this being subject to `national sovereignty and relevant intellectual property rights[39] and, within the UN, to

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[35] Mostafa K. Tolba, 'The 3rd Baer-Huxley Memorial Lecture: Building an Environmental Institutional Framework for the Future,' in Nicholas Polunin and John Burnett (eds.) *Surviving With the Biosphere*, Edinburgh: Edinburgh University Press, 1990, p. 520. Bracketed comment added for emphasis.

[36] Chapter 35, entitled `Science for Sustainable Development', and Chapter 38, entitled `International Institutional Arrangements' both refer to Earthwatch, but only in brief and specific terms.

[37] A/Conf.151/26 (Vol.III) of 14 August 1992 entitled `Agenda 21, Chapter 40, Information for Decision-making.
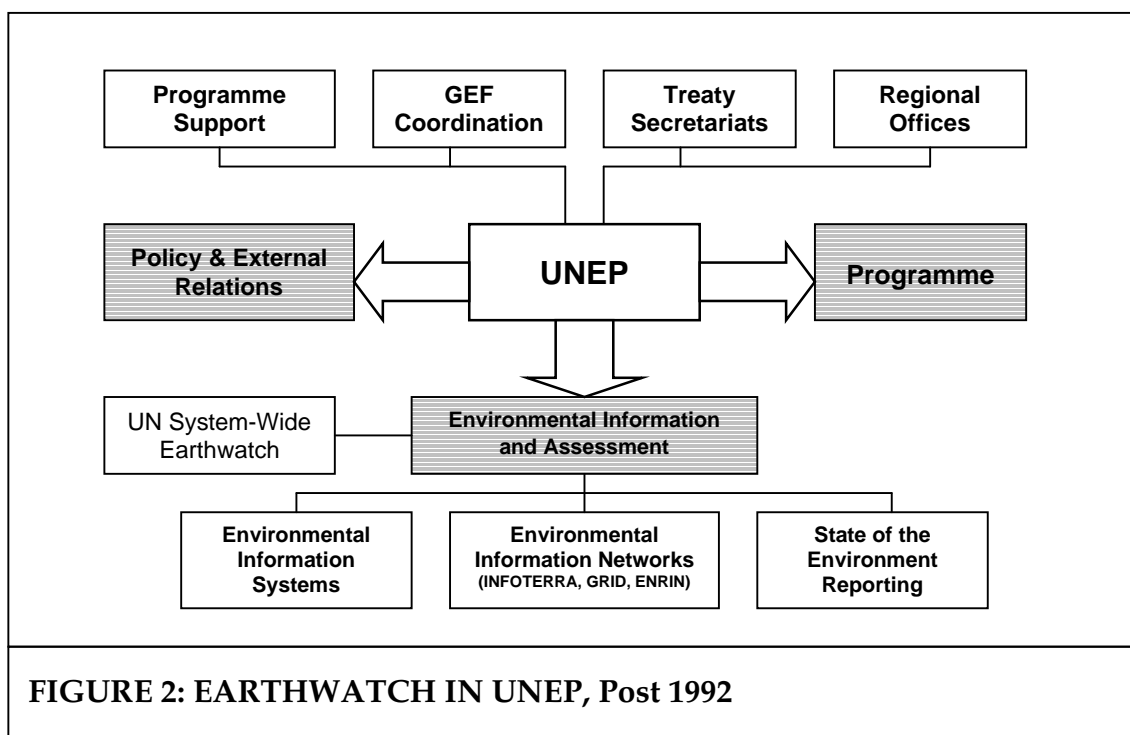
[38] *Ibid*, paragraph 13.

[39] *Ibid.*, paragraph 19.

the fact that member bodies 'should be encouraged' to cooperate.[40]

What may be deemed a limited understanding of scientific information and its use in decision-making was, however, given more concreteness following UNCED. In 1992-93, the newly established Inter-Agency Committee on Sustainable Development and the Administrative Committee on Coordination both confirmed UNEP's role as Task Manager for Earthwatch; a point not immediately certain given the establishment of several other high-level coordinating bodies including the Commission on Sustainable Development.[41] In response to this, UNEP appointed a Coordinator for Earthwatch, who was also given the position of Assistant Deputy Executive Director in the new UNEP Environmental Information and Assessment Division. Following the Rio Conference, UNEP underwent a self-imposed restructuring, during which the Environmental Assessment Programme was replaced with the afore mentioned Division. Thus Earthwatch was established as part of this newly formed Division, but it was no longer constituted it as was previously envisaged *(See Figure 2)*. However, for the first time a secretariat for Earthwatch now existed, giving the concept substance.

To facilitate its work, the Secretariat established an informal advisory body called

FIGURE 2: EARTHWATCH IN UNEP, Post 1992

the Earthwatch Working Party. It first met 1-2 June 1994 to discuss operationalizing Earthwatch. At this first meeting, Earthwatch was given a revised mandate to

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[40] *Ibid.*, paragraph 24.

[41] As late as 1995 UNEP was still concerned about potential overlap between itself and CSD. See, for example, UNEP/GC.18/27 of 21 March 1995 entitled `Policy Issues: Emerging Policy Issues.'

"coordinate, harmonize and integrate observing, assessment and reporting activities across the UN system in order to provide environmental and appropriate socio-economic information for national and international decision-making on sustainable development..."[42] This contrasts substantially with Earthwatch's original `form follows function' definition. The new mandate is much broader, including also the sphere of socio-economic information and the concept of sustainable development. However, unlike the `original' Earthwatch, the new Secretariat was not seen to be an umbrella framework. Instead, Earthwatch was merely to assist other bodies to cooperate with each other, under their own auspices. Thus the Working Party stated: "specific [programme related] activities will be implemented by *ad hoc* interagency technical groups or existing structures within the system as appropriate." [43] This move sought to remove some of the confusion regarding use of the term `Earthwatch'. As UNEP Executive Director, Elizabeth Dowdeswell, stated in a recent report:

> The term `Earthwatch' has been used since Stockholm, often ambiguously, to refer both to UNEP's programme in the area of environment assessment and to the United Nations system-wide environment assessment activities. Although attempts have been made in the past few years to confine its use to the United Nations system-wide context, as in `United Nations system-wide Earthwatch', conventional usage persists in applying `Earthwatch' to UNEP's environment assessment activities, to the relevant activities, or to both.[44]

As far as Earthwatch's substantive work is concerned several areas have been selected by the Secretariat in consultation with its Working Party. These are devised in accordance with Chapter 40 as well as UNEP's new foci as reflected in the restructuring and the Governing Council's Nairobi Declaration.[45] Seeing both data and information themes as being interrelated, the Earthwatch Coordinator has focused on four cross-cutting projects: first, participating in a proposed Global Observing System (GOS); second, contributing to the development of indicators of sustainable development; third, coordinating the UN system's input into UNEP's Global Environmental Outlook (GEO) reports; and fourth, assisting in the development of a UN common information system. In all cases, Earthwatch participates as a partner with none of these efforts falling exclusively under its jurisdiction.

Since 1992 there has been a change in the language of monitoring and assessment so far as the UN system is concerned. No longer is the term `monitoring' used. It has

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[42] Earthwatch Working Party, `Report of the Meeting' held 1-2 June 1994, paragraph 3.

[43] UNEP/EWWP2/WP.2/rev.1 of 6 April 1995 entitled `UN System-Wide Earthwatch Programme Document: Mechanisms for Earthwatch Coordination'.

[44] Taken from UNEP/GC.18/4 of 23 February 1996 entitled `Implementation of Agenda 21: Earthwatch, environment monitoring and assessment,' footnote 2.

[45] UNEP's Governing Council adopted the Nairobi Declaration to reaffirm and strengthen UNEP's role. See UNEP/GC19/1 ' of 7 February 1997 entitled `Role, Mandate and Governance of the United Nations Environment Programme'.

been replaced with `observation'. This shift seeks to overcome both the lasting negative connotations of the term `monitoring' as well as its poor translatability (becoming *surveillance* in French, for example). Moreover, during UNEP's restructuring in 1992, GEMS was abolished in favour of UNEP's participating in the creation of a UN system Global Observation System (GOS).[46] The GEMS projects were problematic insofar as they lacked an overall framework and were largely bilateral. Based on existing data gathering networks, GOS is envisaged as a troika of systems working together to observe the biophysical spheres of the Earth: the Global Terrestrial Observation System (GTOS), the Global Oceans Observation system (GOOS) and the Global Climate Observation System (GCOS). GCOS is the most established, building such past projects was the World Weather Watch (WWW) and the more recent Global Atmosphere Watch (GAW). It is sponsored by WMO. GOOS is sponsored by UNESCO's Intergovernmental Oceanographic Commission (IOC) and GTOS by FAO. In all cases, UNEP is a cosponsor along with ICSU. Despite their similarity in name, each system was conceived of separately and thus concerted effort is now needed to bring them together. Given UNEP's position, Earthwatch has been involved in promoting greater coordination between the sponsors. To this end, a first meeting was held by UNEP, and organized by Earthwatch, in January 1997. One of the main concerns at this meeting was developing a common *raison d'être* for the systems and then tackling areas of potential overlap and gaps.[47]

A further effort to focus earth observation activities as well as guiding decisionmaking has been the development of indicators for sustainable development. Here also the Earthwatch Coordinator has been active together with other sponsoring bodies such as SCOPE and the UN's Department of Policy Coordination and Sustainable Development. Much of this work focuses on providing countries with the capacity to develop their own specific set of indicators. In building this effort a meeting was held in January 1995 under the sponsorship of the governments of Belgium and Costa Rica which included representatives from national governments, science organizations, inter-governmental organizations and NGOs. [48] A recent UN report states that to date 134 indicators, which should help countries in measuring sustainable development, have already been adopted by consensus.[49]

Following 1992, state of the environment reporting has taken on a substantially different character. This includes the publishing of data reports, which are no longer

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[46] For a detailed commentary on the concept of global observing systems written by C.C. Wallen see UNEP/EWWP3/5/rev.1 of 25 January 1996 entitled `The Global Observing Systems'.

[47] For details see UNEP/DEIA/MR.97-5.

[48] See UNEP/EAP.MR/95-1 entitled `Report of the Workshop on Indicators for Sustainable Development for Decision-Making.' Ultimately, the results of the meeting were published as a book: Bedr•ich Moldan and Suzanne Billharz (eds.) *Sustainability Indicators: Report of the Project on Indicators of Sustainable Development*, Chichester: John Wiley and Sons for SCOPE, 1997. For some indication of the work of Earthwatch on indicators see Arthur Lyon Dahl, `Measuring the Unmeasurable,' *Our Planet* (V.8, N.1, 1996) pp.29-33.

[49] CSD Document E/CN.17/1997/2/Add.30 of 23 January 1997 entitled `Overall progress achieved since the United Nations Conference on Environment and Development: Information for decision-making,' paragraph 8.

deemed useful in printed form and have moved to more flexible means[50] Thus, reports such as UNEP's biannual *Environmental Data Report* have been cancelled. Instead, this material is being placed on the internet and being made available electronically in general. Institutionally, a State of the Environment Reporting Unit emerged during the last reorganization of UNEP. The new Unit is responsible for a switch from descriptive state of the environment reporting to more forward-looking reporting, including modelling, projections, and scenarios is envisaged. This is to be reflected in the ongoing series of reports to be published under the title of *Global Environmental Outlook* (GEO). The first volume was published in mid-1997 as *Global Environment Outlook – 1*. This report seeks to be more comprehensive by including many qualitative observations about environmental (and developmental) change. In fact, the report states that:

> the process [developed for the GEO report] endeavors to gradually become an umbrella for global and regional environmental assessments, providing a framework and a mechanism for wide participation and co-operation that will also help build the capacity in developing countries for conducting integrated, policy-relevant assessments.[51]

In this framework, it is Earthwatch's responsibility to coordinate the input of UN agencies into the process.

Finally, the Earthwatch Coordinator is also involved in efforts to develop a common system of information management across the UN system.[52] The aim is to harmonize databases across the system both in their management and dissemination. This has been helped by the increasing popularity of the internet, at least for that part of the world's population with access to computers and telephone lines.[53]

Further ideas have also been forwarded, but have received less attention to the present. One proposal discussed in the Working party, though not implemented so far, is the idea of `Earthwatch Alerts'. While the name seems to be contested, the idea is to create an inter-agency series of policy-relevant research papers.[54] Another proposal, in line with much interest amongst decisionmakers, is the development of early-warning mechanisms for detecting and reacting to major international environmental problems.[55]

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[50] Within UNEP data is being provided by GRID, INFOTERRA and the Environmental Legal Instruments Database (CELIB).

[51] UNEP, *Global Environment Outlook – 1*, UNEP: Nairobi, 1997 as reproduced on the world-wide web, Chapter 1. The GEO Report can be found via UNEP's homepage under the title of UNEP Products.

[52] For more detail see UNEP/EWWP3/3 of 9 November 1995 entitled `Conceptual Evolution of a UN Information System' and UNEP/DEIA/MR.96-12 of 24 September 1996 entitled `Workshop on Information for Sustainable Development and Earthwatch'.

[53] See CSD Document E/CN.17/1996/18 of 1 March 1996 for an extensive list of internet addresses of sustainable development related sites.

[54] UNEP/EWWP2/3 of 23 March 1995 entitled `Report of the second Earthwatch Working Party Meeting', paragraph 10.

[55] The Earthwatch Secretariat submitted a discussion paper on this topic to the working group in 1996 under the document identification code UNEP/EWWP3/4.

However, little consensus exists on what timeframe is envisage (short of long term early-warning) or what constitutes an environmental `problem' or even `emergency'. Therefore, this will likely have to wait until later in time.

II.
EARTHWATCH'S PRACTICE CONCEPTUALIZED

Over the last two decades, Earthwatch has changed dramatically both in concept and practice. To better understand the stage Earthwatch is at now or where it ought to be, it is essential to understand its history. More clarity in this regard is an invaluable basis for developing this programme and avoiding the pitfalls of the past. To this end, the analysis turns to the central question of this paper: Why have such difficulties been faced in defining and implementing Earthwatch. There are two aspects to this question; first, the definition and, second, the implementation. The definition is the conceptual matter and its translation into a mandate. That is, how science and policy have been seen to relate to each other. Implementation, in turn, is the matter of how this mandate is translated into practice. This relates to the practice of Earthwatch. Over time, a gap has emerged between the theory and practice. Recent activities are seeking to reverse this, however without contextualizing this formally within the history of Earthwatch's development. Moreover past reviews are inadequate as these have consistently left untouched questions of the relations between Earthwatch's ideal contribution and its practice. Reviews tended to propose various ideals without reflecting upon these in practice. This paper argues that the central problem to date has been expectations as to the relations between science and policymaking. That is, the main problem has been reconciling the knowledge production sphere, as composed of collecting and managing data and formulating assessments, and the action sphere, policymaking.

In looking at Earthwatch's history three distinct approaches to conceptualizing the relations between science and policy can be identified: the functional, the feeder of information and the assessments for policy approach. While each emerges at a certain point and this analysis treats them temporally, they are not mutually exclusive in substance or time.

i. THE FUNCTIONAL APPROACH

The first period of Earthwatch's development may be characterised as one dominated by a functional approach. In using this term here I draw both on its use by Earthwatch's proponents in the early 1970s and on the work of its principal theoretical articulator, David Mitrany. Functionalism is seen as a conscious means of introducing what are deemed to be non-political forms of action into the realm of policymaking, without subjecting the former to the latter's pressures and confusions. Two aspects of this approach warrant highlighting here: first, the separation of science and policymaking and, second, the link between them.

Traditionally, in post-war international relations, science and policymaking were generally viewed as entirely separate spheres of action. The former was the provider of objective data and information and the latter the muddled affairs of international diplomacy.[56] International monitoring and assessment programmes were seen to be part of the former and Earthwatch, as the coordinating umbrella, likewise. The priority initially was to collect data; hence the importance of GEMS. Over time, it was envisaged that the assessment programme would `practically' develop as individual GEMS activities began to form a network of integrated databases. Assessments would reflect priorities evident from analyses of the data. Thus the research, evaluation and review areas of UNEP's Environmental Assessment programme were extensions of data management. They were viewed neither as social analyses nor as politics. As Gosovic has stated:

> Assessment was regarded as a relatively precise, quantifiable category. It was considered to belong to the domain of scientific and technical communities, and was supposed to generate the neutral, hard-data inputs and conclusions for management, a softer category involving a social process. The two were linked through a feedback loop, and together formed an integral whole.[57]

The fact that developing states called for a renaming of Earthwatch may thus be seen as `politicization' or the introduction of politics into functional, or technical, cooperation.[58]

The functional approach's other characteristic is that science, in this case monitoring and assessment activities, are seen to be an essential precursor to policymaking. The data and ensuing assessments were taken to provide policymaking with the priorities the latter would act on *(See Figure 3, Diagram 1)*. Moreover since science related work was seen to be objective, the policymaking process was in fact seen as no more than an administrative exercise. The predominant view of the proponents of UNEP's functional approach may be described as being quite instrumental insofar as these expected that particular interests or discontents between states and societies would be subsumed within an overarching `environmental agenda' or, alternatively, driven by

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[56] Early conferences, such as the United Nations Scientific Conference on the Conservation and Utilization of Resources (UNSCCUR) held in 1949, were often explicitly seen to be non-political. In a history of international environmental institutions, McCormick states that UNSCCUR was intended as a 'purely' scientific event: "it discussed science, not policy (although questions of policy were inevitably touched upon); it had no power to bind governments and did not make recommendations to them, nor attempt to reach international agreements," in *op. cit.* in note 20, p.37. Similarly, when signing partnership agreements with five scientific and technical non-governmental organizations, UNESCO categorized them as representing medical, engineering and agricultural sciences as well as the pure sciences; in the latter's case the body being ICSU. See UNESCO/Cons./Exec./2e sess./27 (1947) entitled, `Explanatory `hierarchical' list of international scientific organizations'.

[57] Gosovic, *op. cit.* in note 1, p.xvii.

[58] For a study of politicization as the challenge to the functional premise for international cooperation, see Mark F. Imber, *The USA, ILO, UNESCO and IAEA: Politicization and Withdrawal in the Specialized Agencies*, London: MacMillan Press, 1989. In a more closely related context Sheila Jasanoff lists politicization as one of the three impacts of separating science from policy; the other two being encroachment on territory and confrontational debates. See *The Fifth Branch: Science Advisors as Policymakers*, Cambridge, MA: Harvard University Press, 1990, pp.229-250.

an `environmental imperative'. Though development issues had been discussed already at Stockholm, primacy in these early years was unquestionably given to environmental protection. This view is very much reflected in, for example, George Kennan's `infamous' article in which he proposes that a new international environmental body ought to be run only by developed states so as to be more effective.[59] The argument by Kennan being that environmental issues were far too important to be made subject to international politics, and especially to states of which many had only a limited scientific capacity. More subtly, Richard Gardner stated, with regard to economic and social work that "[h]enceforth, and increasingly in the 1970s, the world organization [the UN] in its nonpolitical [*sic*!] work will be concerned with the `quality of life' issues as well as GNP."[60]

As the critiques and the ongoing review processes suggest, Earthwatch failed to fulfil its expected purpose through functional means. This stems partly from the fallacious belief that monitoring and assessment is non-political. Merely because two different bodies engage in monitoring and assessing the same environmental indicators, does not mean they will subsume their work to an `environmental imperative' and thus cooperate. In this sense, scientific cooperation cannot be separated from political cooperation or policy-making. Whether it is physical environmental research or economic and social analysis, cooperation is a conscious pursuit decided upon, for or against, by each of the participating bodies. Moreover, the United Nations is a political body and scientific projects within that context inherently support that politics or they would not be part of it. In short, for Earthwatch proponents to expect a natural evolution of a purely scientific, or technical, monitoring and assessment network was wrong.

ii. THE FEEDER OF INFORMATION APPROACH

The UN Conference on Environment and Development distinctively changed Earthwatch, both as a concept and in practice. The shift was certainly not absolute or overnight. The principal influence cam from the international political climate which was increasingly focusing on such issues as the importance of linking human development with environmental change, the collapse of the Cold War, and also changes in political discourse including debates about democratization, social justice and environmental ethics. This had substantial repercussions for the practice of international environmental politics and for Earthwatch. For example, no longer was it assumed that environmental problems were essentially technical in character or that
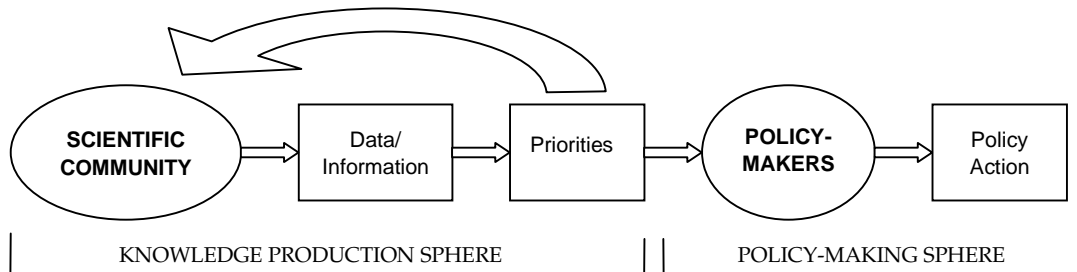
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[59] George F. Kennan, `To Prevent a World Wasteland: A Proposal,' *Foreign Affairs* (V.48, N.3, April 1970)

[60] Richard N. Gardner, `The Role of the UN in Environmental Problems,' *International Organization*, (V.26, N.2, 1972) p.237.
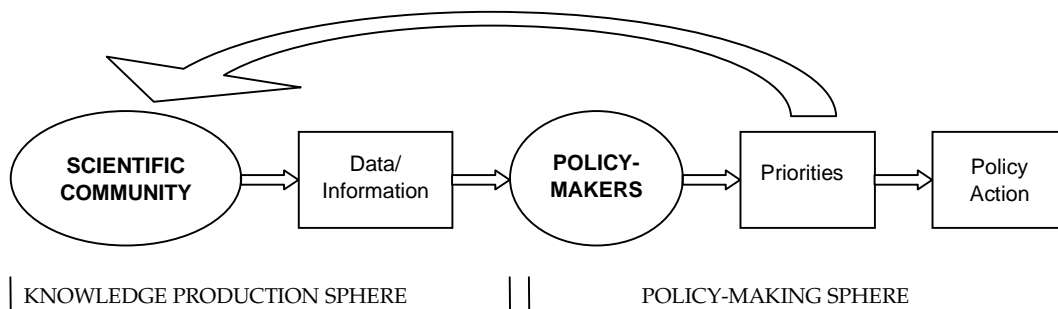
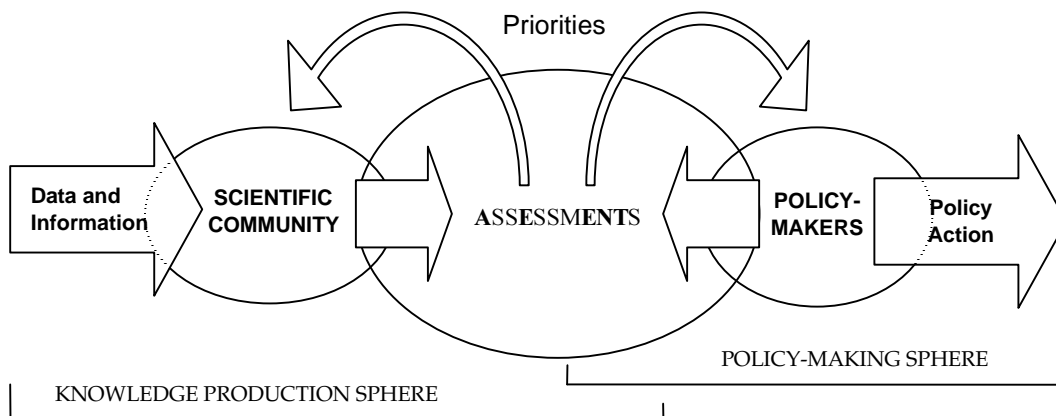**FIGURE 3: THE RELATIONS BETWEEN SCIENCE AND POLICY IN EARTHWATCH OVER TIME**

1. THE FUNCTIONAL APPROACH (1972)

2. THE FEEDER OF INFORMATION APPROACH (1992)

3. THE ASSESSMENTS FOR POLICY APPROACH (Present)

there existed an *a priori* environmental imperative. This is reflected in the emphasis on the more self-consciously anthropocentric use of the term `sustainable development' at Rio.

At the same time, academia also began debating the role of science in policy, with myriad books being published on the matter about 1990.[61] However, despite a growing awareness of the complexity and qualitativeness of the human/environmental relations, many of the characteristics of the functional approach remained in practice. The Rio Conference also reflected this and so did the view of Earthwatch at that time. For the sake of simplicity, I will refer to this conception of Earthwatch as a `feeder of information approach'.

The feeder of information approach is characterised both by continuing to separate science from politics, though along a different axis, and by the linearity of their relationship. The separation of science from politics in this approach is somewhat different than in the functional approach. The latter view holds that science and politics are two distinct, and mutually exclusive, spheres of action. This was the ideal side of what Jasanoff has referred to as the `cartographic challenge.'

> The cartographic challenge for scientists is to draw science near enough
> to politics (ideally, as adjacent cultural territories) without risking
> spillover of one space into another or creating ambiguity about where the
> line between them should fall.[62]

Under the functional approach, the cartographic view was shared. During the 1990s this view perhaps continued to be held by scientists, but certainly no longer by policy-makers. Agenda 21 reflects a new reality of policy-maker as cartographer. Science was given a more restricted role at least so far as UN related work was concerned.[63] In many respects, the filling of data gaps and nominally providing information for decision-makers have always been the scope of practical priority for Earthwatch. The difference in 1992 lies in the narrower role for science stated explicitly. In other words, what Agenda 21 served to define more precisely it also narrowed substantially. In effect, Earthwatch's conception was narrower, its mandate expanded, and yet the practice was

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[61] I recognize that critiques of the `science-as-saviour' approach to environmental protection also emerged prior to Stockholm, but without going into detail I would argue that in 1992 that debate was much broader and more well developed. Among the most prominent examples of works of the 1960s is Rachel Carson's, *Silent Spring*, New York: Houghton Mifflin,1962. Two other articles which argue that `established' science played a central role at UNCHE are Lynton K. Caldwell, *In Defense of Earth*, Bloomington: Indiana University Press, 1972 and R.J. Bazell, `Human Environment Conference: The Rush for Influence,' *Science* (V.174, N.4007, 22 October 1971) pp.390-291.

[62] Gieryn, Thomas F., `Boundaries of Science,' in Jasanoff, Shiela *et. al.* (eds.) *Handbook of Science and Technology Studies*, Thousand Oaks: Sage Publications, 1996, p.435.

[63] This view partly agrees with one of the few articles reviewing the role of scientists at UNCED. Julia Marton-Lefèvre states that UNCED was more firmly "in the hands of UN administrators and diplomats than scientists." I do not agree with her statements that this dominance of policymakers is traditional in the area of the environment, or that the role of science was strengthened during the UNCED process. See `The Role of the Scientific Community in the Preparation of and Follow-up to UNCED,' in Bertram I. Spector, Gunnar Sjöstedt and I. William Zartman (eds.), *Negotiating International Regimes: Lessons Learned from the United Nations Conference on Environment and Development*, London: Graham & Trotman, 1994, pp.171-180.

to remain the same or at least similar. Conceptually the relations between science and policy are seen more narrowly. At the same time, the need for knowledge production to include socio-economic information to better understanding the concept of sustainable development, should have expanded those relations. And finally, in practical terms, the relations between science and policy as reflected in Earthwatch's practice remain similar.

In linking these two areas the relationship remains linear or sequential.[64] That is, scientists provide the data and information and policymakers provide the priorities and policy *(Figure 3, compare Diagrams 1 and 2).* There is no interactive process of information or idea exchange. Science's role was seen exclusively to provide information necessary for policymaking. The linear approach, both in functional and in feeder of information terms, accords assessments only a marginal conceptual role. In practice, Earthwatch's work reflects this throughout its history. Any assessments, such as the reports of 1982 and 1992, were `one-off' and could not be treated on a time-scale or comparatively. The Functional approach implicitly assumes assessments to be part of the science process wherein they emerge `automatically' from priorities pointed to by data. The science as feeder of information approach states explicitly that policy-makers require a certain type of information from science, but limits the latter's scope of action.

iii. THE ASSESSMENTS FOR POLICY APPROACH

Following the establishment the position of Coordinator, the practice of Earthwatch changed again. In recognizing that the lack of defined means to inform decision-makers had to be changed, the emphasis in Earthwatch was shifted explicitly to assessments. The aim was to consciously develop the link between science and policy. This was seen as a matter of providing `value-added' before the data and information were passed on. The four areas of work currently being pursued by Earthwatch reflect this.

Two interrelated tasks underlie the building of the link between science and policy. The first task is to encourage more systematic cooperation between international scientific efforts and the second, making the related data and information relevant to policy-making processes. Far from the administrative task that was called `coordination' under the functional approach, the first task here involves the conscious promotion of cooperation between independent efforts. This is a formal task of sorts, and cannot be left, as experience has shown, to the `magical' workings of an environmental imperative. Earthwatch traditionally was expected to provide a formal institutional umbrella; a source of skepticism amongst specialized agencies. To avoid the problems associated with subsuming the work of various bodies under the umbrella of a third, *i.e.* putting an Earthwatch label on projects outside of UNEP, the Coordinator instead has chosen to encourage others to cooperate under their own auspices.[65] This approach may well

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[64] For a full discussion and critique of this approach to linking science and policy see Jill Jäger, `Linkages Between Knowledge and Action in the Management of Global Environmental Risks,' in The Social Learning Group (eds.), *Learning to Manage Global Environmental Risks,'* to be published by MIT Press.

[65] *Ibid.*

provide a useful alternative to the failed umbrella approach. Instead, it now to Earthwatch to provide an example which will encourage other bodies to follow. In refering to UNEP (though also reflective of Earthwatch) Lee Kimball suggested that "[b]y specializing in … catalytic assessment and research activities … UNEP becomes the `demonstration project' for a national environmental agency and can reserve a role for advising governments on these matters."[66] This would be similar for other international organizations.

In the context of the UN system, making the results of this cooperation policy-relevant is the second essential task. Encouraging not only data related work but also qualitative analyses, through GEO-1 for example, is perhaps the most important step that has been taken. In a shift from a few years ago, Earthwatch has managed in this regard to reconcile its mandate and practice. Beyond reflecting a more open-ended view of knowledge, recent action also bridges the empirical and analytic (what is) and the prescriptive (what ought to be) realms of its production. Since science is principally concerned with the former and policymaking with the latter, this bridge allows both spheres to participate in knowledge production. In a seminal article in 1970 Alvin Weinberg coins this `trans-science': that type of knowledge production which asks questions that science alone cannot answer.[67] In a more recent article, Simon Shackley and Brian Wynne go a step further and describe what evolves as a distinct science-policy domain characterizable as a "material institutional and cultural enterprise."[68] This is the sphere of assessments which are at once shaped by the interaction of science and policymaking but also show priority areas to them *(See Figure 3, Diagram 3)*. This dynamic interaction should result not only in a broader debate, but one that is forward looking. In a recent comparative study of the link between knowledge and action in four environmental problem areas, Jill Jäger observes that the intensification of the link could be associated with the emergence of self-conscious evaluations of progress achieved in a given area.[69]

Providing a catalytic and funneling role are the immediate tasks at hand for Earthwatch. However, beyond this a matter yet to be addressed is the nature of the policy response that can be expected. There exists no a priori policy response to a comprehensive and even policy relevant assessment. The next step is to see that policy-relevant assessments are also deemed `useful' by policymakers. Throughout the last twenty years various efforts have existed to provide scientific advice to policy. Some examples of global relevance include GESAMP, IPCC, the Ozone Trends Panel, IIASA's RAINS model as well as UNEP's *Global Biodiversity Assessment* and *GEO-1 Report*. In academia the number of studies into one or another of these bodies has increased

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[66] Lee Kimball, `Toward Global Environmental Management: The Institutional Setting,' in Günther Handl (ed.), *Yearbook of International Environmental Law (V.3),* London: Graham and Trotman, 1992, p.26.

[67] Alvin M. Weinberg, `Science and Trans-Science,' *Minerva* (V.10, 1970).

[68] Simon Shackley and Brian Wynne, `Global Climate Change: The Mutual Construction of an Emergent Science-Policy Domain,' *Science and Public Policy* (V.22, N.4, August 1995) p. 221. This article encouraged a small debate which appears in subsequent issues of the same journal.

[69] Jäger, *op. cit*. in note 64, pp.17-27.

dramatically, in particular relating to IPCC. What needs to be done now is to compare and contrast systematically the range of policy responses to different forms of scientific advice.[70] Such a study could be developed along three axes. The first asks about what has constituted science in the advisory bodies. For example, is the emphasis on physical or social sciences or a combination? The second axis asks about the form advice, or assessments, have taken. In the case of the GEO Report the aim was to be more forward looking. What other approaches exist? And, third, what have the policy responses been to each of the bodies? This axis might ask about the impact of each advisory body on policy outcomes. Ultimately, this would provide a better sense of what forms of scientific advice have proven most `useful' and `effective' to date. Moreover, it would show what gaps exist. For example, it is likely that local knowledge was included quite rarely in scientific assessments, despite possible relevance. The impact of such a study would be tremendous, if it were able to provide conceptual guides for future international environmental efforts which draw on the whole of the UN system's expertise and beyond. In a narrower sense, it would provide Earthwatch with a better understanding of the juncture between its two tasks as described here.

CONCLUSIONS

This paper has not addressed the term international environmental governance directly. For purposes here, it suffices to say that the term may be understood as the sum of all cooperative action taken to reconcile human development and environmental change. The theory of this and its implications are beyond the scope of this paper. However, this paper has addressed an important component of this: how knowledge production is conceived of in its relations to policymaking. Concerning environmental change, this is the sphere of UNEP and Earthwatch.

As Gosovic pointed out Earthwatch is a microcosm of UNEP. Over the years this has not changed. Both bodies are small and poorly funded, while having remarkably broad mandates. These mandates in turn reflect some of the core concerns facing international relations today. As the history has shown, the usefulness of both bodies cannot be found in defining them as one thing exclusively; Earthwatch is not pure science nor is it policymaking. Its future lies in articulating and building the means to link both spheres in an ongoing and dynamic process of knowledge production and action. Given the ever-changing nature and complexity of this process a certain minimum of conceptual clarity is important. A conceptual framework is a means of guidance for those working within this sphere and increases transparency for those outside. For this reason, it is also important to develop the frame in a practically useful manner. The project this paper proposes is a step in this direction.

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[70] The idea comes from Dahl during meeting of 8 August 1997.