UNITED NATIONS ENVIRONMENT PROGRAMME

DEFINITION OF INTERNATIONALLY SHARED NATURAL RESOURCES

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Note: The views expressed in this paper by the author are his own and are not necessarily the views of UNEP.

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SUMMARY

This paper seeks to establish a working base for the formulation of a suitable definition of internationally shared natural resources, for the purpose of policy guidance and law making. It presents a first synthesis of the relevant data and elements and suggests various concepts for further consideration.

The data, from which the sample inventories of natural resources susceptible of sharing, and of possible transborder impacts have been confected, come largely from United Nations documentation and operational information. The methodology is based on the ecomanagement paradigm, considered particularly suited to synthesis of data which deal with the interface man/resources, and to their transformation into the language of policy and law.

The paper presupposes and attempts to stimulate cross-disciplinary dialog between lawyers and natural-resource experts, which would enlarge the base of the definition, refine its wording and prepare the ground for its practical application.

ABBREVIATIONS

The following less common abbreviations are repeatedly used in the text and notes:

CNRET	[U.N.] Center for Natural Resources, Energy and Transport
EEZ	Exclusive economic zone (200 miles beyond the outer margin of the territorial sea)
IG	Intergovernmental Working Group of Experts on Natural Resources Shared by Two or More States/UNEP
LOS	Informal composite negotiating text, Third Conference on the Law of the Sea, Sixth Session. 15 July 1977.
SNR	Shared natural resource(s)

TASK, SOURCES, METHOD

Terms of reference

1. The operative clauses in the consultant's terms of reference are these:

(a) "to identify the various definitions [of] the term 'a shared natural resource'";

(b) "to formulate a suitable definition for consideration by the Intergovernmental Working Group of Experts on natural resources shared by two or more States" (IG);

(c) "to suggest alternative methods of dealing with problems a definition could cause."

2. The framework for the interpretation of these terms of reference is the language and intent of the General Assembly resolution 3129 (XXVIII), 13 December 1973, specifically,

(a) the title "Co-operation in the field of the environment concerning natural resources shared by two or more States," and

(b) the key clauses in paragraphs 1 and 2: "establishment of adequate international standards for the conservation and harmonious exploitation of natural resources common to two or more States in the context of the normal relations existing between them;" and

"co-operation between countries sharing such natural resources and interested in their exploitation... on the basis of a system of information and prior consultation...."

3. The consultant referred also to the several interpretations and applications of the key terms,[1] as well as the antecedents of Resolution 3129,[2] the direct reference of which is the Declaration of the United Nations Conference on the Human Environment, and the Action Plan for the Human Environment.[3]

Sources of reference

4. The consultant made use of the following sources of information and analysis:

(a) the documents which established the IG,[4] provided its initial working framework,[5] and summarized the first four sessions of the IG[6] as well as their discussion in the Governing Council;[7]

(b) summaries of GC discussion and decisions in such related fields as environmental law, and environment and development;

(c) a substantial sample of information related to natural resources and shared natural resources (SNR), which originated within the U.N. systems, as well as in other international agencies;

(d) information gathered for the purpose of this report through interviews and exchanges with officials of various specialized agencies and other organs of the United Nations that deal with research on, or the management of, natural

resources;

(e) selected international agreements, national legislation and de lege ferenda documentation relevant to the subject of this report;

(f) recent scholarly and technical literature.

Working paradigm [8]

5. The effort to develop a definition of internationally shared natural resources requires, in essence, that information about natural resources, their management, the forms of their international sharing and the transborder impacts thereof, be transformed and expressed in terms useful to positive international law making. The concept is admittedly complex and the subject matter--more precisely, the data base and its understanding--is "continually evolving." [9] The task requires an integration of the "technical" and the "legal" aspects.[10] It is, in fact, an aspect of a whole system of problems and tasks. The adequate eventual response is likely to be an institutionalized multidisciplinary process, by means of which lawyers, together with natural scientists, natural-resource-management experts and development economists, will establish and keep up to date the legal and operational framework for international ecomanagement on the bilateral, regional and global levels. [11]

6. Sufficient body of concepts and methodology, including policy analysis/synthesis and modern empirical jurisprudence,[12] are available to pursue the present task to formulate and

apply a suitable definition of SNR. The aspects of the working paradigm most relevant to the present task are organized in Figure 1.

[Figure 1.]

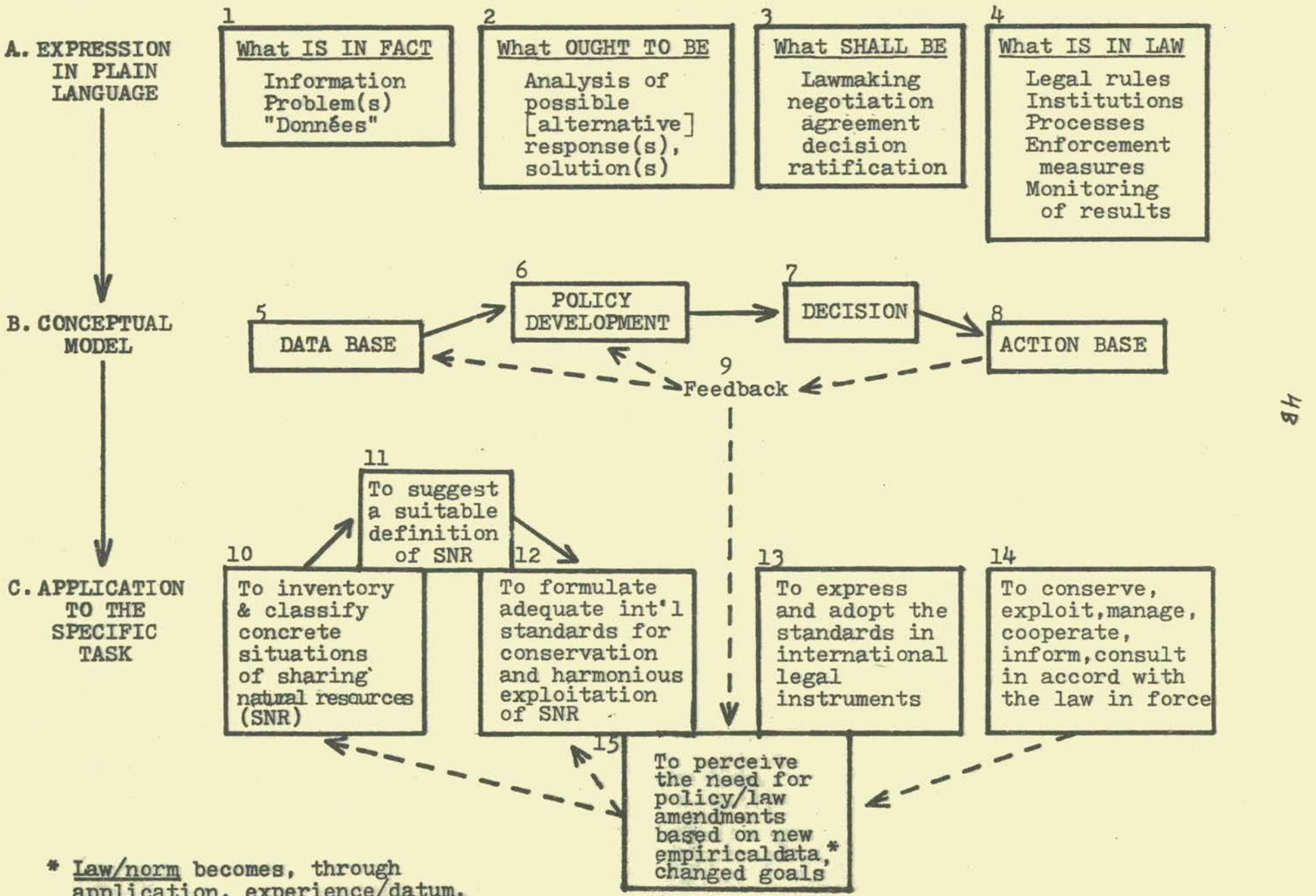
Some implications

7. The primary overall implication of the model is that it represents environmental lawmaking as a process which starts in fact with a more or less extensive information infrastructure and proceeds to transform this data base into / policy and legal terms on which environmental decision- and lawmakers can act.[13] To foment such an approach to environmental law and management is considered to be the intent of UNEP/GC decisions 99 (V) (b) [coordination between the IG/SNR and the group of experts on environmental law] and 100 (V) [the development of "a link between concepts and / practical action" in environmental management, of which law is, indeed, one of the principal instruments for implementation].

8. Secondly, / despite the fact that the two controlling principles of the Stockholm Declaration related to the present task establish a balance between

Figure 1.

ENVIRONMENT LAW AS A PROCESS



* Law/norm becomes, through application, experience/datum.

prevention (Principle 21: "States have...the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States...")[14] and remedial action (Principle 22: "States shall co-operate to develop further international law regarding liability and compensation [for damages] caused...to areas beyond their jurisdiction"), law has had traditionally the tendency to emphasize remedy. By its emphasis on the need to start toward law from an adequate data base, including the information about the natural and human ecosystems to be administered with the help of law, the ecomanagement paradigm puts prevention in the appropriate priority position.

9. Thirdly, the specific tasks before the IG--the definition of SNR and the formulation of draft principles of conduct ("adequate international standards" in the language of Resolution 3129)--are represented in the schema by boxes 11 and 12 on level C. Task 11 is a link between data and policy; task 12 corresponds to the stage of policy development. This is removed several steps from authoritative lawmaking.[15]

10. Finally, as much as the paradigm parallels the progression in the sciences from data through working hypotheses to scientific precepts and laws, the status and function of a definition of SNR falls essentially in the category of a working hypothesis, "true" until there is sufficient new information to change it. This analysis would seem to remove concern about

"exhaustive" or "broad" definitions, "enumerative lists" and the like.[16]

SUBTASK ONE: TO IDENTIFY THE EXISTING DEFINITIONS OF "A SHARED NATURAL RESOURCE"

The state of the art: Description

11. Despite numerous past references to SNR going back at least to the early 1950s,[17] the respective sharing has tended to be assumed rather than defined. Various documents, some of them de lege ferenda, either "define" a specific SNR in descriptive terms or provide descriptive lists of categories of SNR for the purpose of illustration. In response to a specific inquiry by the Executive Director of UNEP, one Government identified SNR with "international commons" shared by a "limited number of States," as exemplified by air mass, adjacent waters, stocks of fish and [international] rivers. Another Government stressed the characteristic of shared sovereignty and illustrated the conception by distinguishing international contiguous (shared) and successive (not shared) rivers. The Economic Commission for Europe provided a list of categories of sharing by a limited number of States in Europe.[18] During the second session of the IG, two elements of the "concept of shared natural resources" and of its relation to the principles under formulation were suggested: the distinction between renewable and non-renewable resources; and the fact that "shared natural resources should be identified [for the purpose of definition] according to the

nature of the resource itself." 19/ Finally, the following definition was proposed but not further discussed during the third session of the IG: "The term 'shared natural resource' means an element of the natural environment used by man which constitutes a biogeophysical unity and is located in the territory of two or more States." 20/

Synthesis

12. "The existing definitions" of SNR tend to fall into one of these categories:

(a) description of a particular SNR; 21/
(b) illustrative list of examples of SNR; 22/
(c) exemplary list for the purpose of future legal agreements; 23/
(d) conceptual definition. 24/

SUBTASK TWO:
TO FORMULATE A SUITABLE DEFINITION

The characteristics of a suitable definition

13. It is postulated that a suitable definition for the

present purpose must be:

(a) conceptual/analytical, rather than descriptive;

(b) empirical, that means that the concepts must express in generic terms known specific fact situations;[25]

(c) comprehensive enough to cover all the known situations and to accomodate situations of sharing anticipated but not sufficiently documented at the time the definition is adopted;[26]

(d) operational, that is directed at the dynamics and problems of resource sharing, rather than at the SNR themselves;

(e) expressed in terms suitable for eventual legal application.

Semantic and policy framework for a definition

14. The terminology of Resolution 3129 is not unequivocal. Accepting the relevant parts of the composite interpretation contained in the Report of the Executive Director,[27] it may be stipulated that

(a) the subject to which the definition is to direct itself is natural resources (without any distinction or exclusion) shared by (or, common to) two or more States (with no numerical limitation);

(b) the adequate international standards for effective cooperation are being sought with respect to conservation[28] and exploitation;[29]

(c) the cooperation is to take place in the field of the environment, with no specification or limitation. This agrees with the conception of natural resources in (a) above, but limits the cooperation to conservation and harmonious exploitation; thus it excludes other types of cooperation such as in economic development, technology sharing and the like;

(d) anticipates situations where a particular country is not interested in exploitation; in such a case the term sharing in paragraph 2 of Resolution 3129 must be understood as referring to conservation only.

15. It was discussed, but not finally determined, whether the term utilization would not be preferable to exploitation, on the ground that exploitation has a limited economic connotation. Utilization has, indeed, a more benign connotation although a related term, disutility, has a technical meaning of harmful, negative effects of the economic uses of resources.

16. For several reasons it appears advisable to retain the term exploitation:

(a) Economic exploitation is harmful to the environmental resources only if (i) it is carried on without regard to external (i.e., environmental and social) cost; (ii) if it occurs at a rate which, in the case of flow (renewable) resources, puts in danger the base of a sustained-yield regime or undermines the ecosystemic capacity for regeneration; or, which exceeds a reasonable rate of depletion in the case of

stock (non-renewable) resources. To prevent these consequences and correct the damage already caused are the tasks of the two aspects of conservation (see note 28).

(b) Overexploitation can be also noneconomic (though the underlying causes are economic), for instance when such "conditions of underdevelopment" 30/ as extensive, dense or substandard human habitats have a severe impact on land, water and air resources, and environmental health systems in general.

(c) It appears terminologically simpler to retain the language of Resolution 3129 and distinguish between (i) [harmonious] exploitation, comprizing / all uses of natural resources that are synchronized with conservation in the complete sense of ecomanagement; the term utilization, if used, would then have the meaning of exploitation without an excessive rate or damaging impact;
(ii) other kinds of exploitation, informed only by short-term economic considerations, that result in severe impact on the natural resources involved, especially also on environmental resources. In this sense, pollution is simply an overexploitation, a dyseconomic utilization of these resources, the opposite of rational management.

(d) In sum, it appears to favor terminological clarity and simplicity to use the comprehensive terms exploitation and (eco)management 31/ -- harmonious exploitation being only that utilization of natural resources which corresponds to the conservation/ecomanagement standards.

Analytical steps toward a definition

17. It appeared early in the preliminary analysis that there does not exist an a priori group of SNR. There are natural resources susceptible of sharing. Some of them form units (ecosystems, biomes), but become shared (or potentially shared) because of facts of political geography. This may create a forced interest in sharing. But there are other aspects of this kind of necessary sharing, such as the protection of survival resources, or of public health, or of public and private property against natural disasters. There is also deliberate, voluntary, proprietary interest in shared exploitation. Finally, there is the possibility envisaged by Resolution 3129 that some potential sharer is, in fact, not interested in the exploitation of a sharable resource.

18. The term "interest" appears almost inevitably even in the preceding descriptive enumeration of the various aspects of sharing a natural resource. It is so because it does not have some casual connotation which would make it interchangeable with other terminology. "Interest" has a meaning long and generally accepted in jurisprudence. In the context of this meaning (a) substantive law consists of rights and corresponding obligations, and (b) rights are legally recognized and protected interests. Thus, interest is the basic conceptual building block in law. Combining the non-technical and the jurisprudential meanings makes the term interest particularly suited for the purpose of

a definition of SNR.

19. In sum:

(a) the concept of a shared interest, rather than a shared natural resource, appears to be analytically more adequate for the purpose of a policy- and law-oriented definition;

(b) the task to formulate the definition requires the following steps:

i. to determine the scope of natural resources susceptible of sharing;

ii. to perceive the several forms of sharing--forced, necessary, deliberate--in function of the various legal and management interests and obligations;

iii. to express this in terms of a definition and modes of conduct suitable to be incorporated into international legal instruments.

Working inventories

20. In the absence of authoritative inventories of natural resources susceptible of sharing[32] and of the other aspects of the problem as outlined in subparagraphs (a) to (c) of the preceding paragraph, the consultant confected, on basis of the available reference and within the time constraints implicit in the assignment, the following working inventories,

(a) natural resources susceptible of sharing,

(b) shared interest,

(c) transborder impacts,

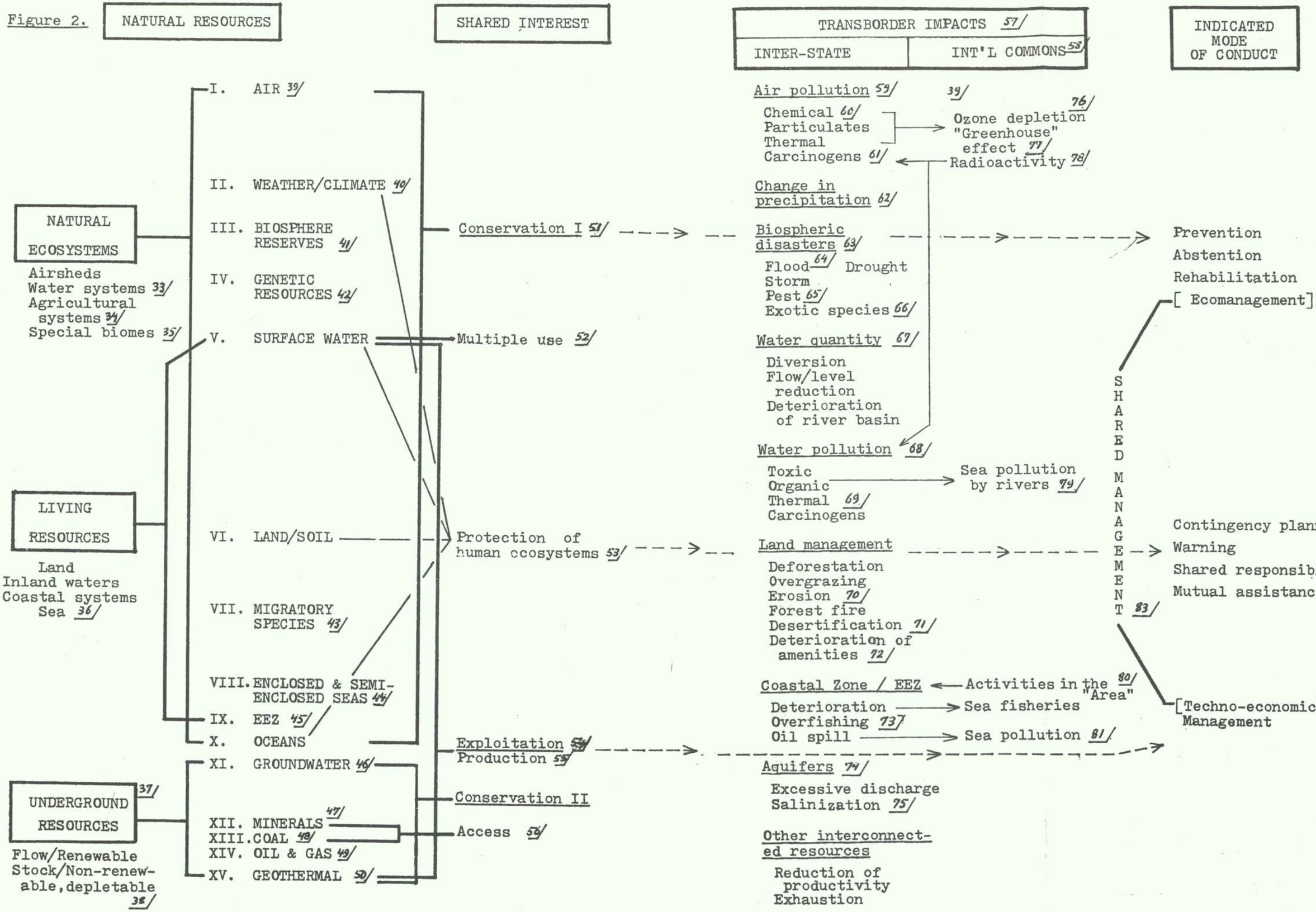
(d) indicated mode of conduct.

Despite the preliminary nature and the obvious need for complementation and modification, the inventories of natural resources and of transborder impacts are considered to be reasonably complete samples for the immediate purpose. To facilitate the consideration of these inventories for the purpose of a definition of SNR, they are tabulated in Figure 2.

[Figure 2]

[This figure consists of two pages which must face each other in the processed document, unless they are joined and folded.]

Figure 2.


NATURAL RESOURCES
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Drought
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Warning
Shared responsibility
Mutual assistance 82/
[Techno-economic] Management

A proposed working definition

21. Three preliminary points are in order:

(a) As was already implied in par. 10, a definition has no normative status in any sense of the word.

(b) A definition is a working synthesis of what is--in the present instance, an expression of the interrelated systems of data and interests as represented in Figure 2 and interpreted in the text above and in the relevant notes.

(c) The definition of SNR is oriented toward normative application in policy, law and management, as the process was schematized in Figure 1.

22. The following draft text is proposed as a base for discussion:

(1) A natural resource shared by two or more States is any natural resource which
   (a) has one or more characteristics listed below in paragraph (2), and
   (b) has a location or dynamics defined in paragraph (3), and
   (c) is the object of a shared interest as defined in paragraph (4).

(2) A natural resource is a resource which exhibits any of the following characteristics:
   (a) specific natural resource, such as air, water, land, flora and fauna;
   (b) system of natural resources (ecosystem, biome) in all the various aspects of its dominant character and components, natural cycles and flows (airshed, water

system, wild nature system);

(c) migratory species on land, in the air, in inland waters or in the sea;

(d) underground resource, on the land or in the subsoil of the territorial sea or continental shelf.

(3) As to its location or dynamics, a shared natural resource is either

(a) located within the jurisdiction of two or more States, whether on, above or below surface; or

(b) moves or flows

(i) from the territory of one State into that of another State;

(ii) between the territories of two or more States;

(iii) from the territory of one or more States into the international commons, or vice versa.

(4) A shared interest in any natural resource is the common interest of two or more States in conservation, exploitation, multiple use, access, prevention of natural disasters or protection of the human ecosystem against them.

(5) Assimilated to a shared natural resource is any situation where the exploitation or conservation in the territory of one State

(a) affects the territory of another State or States, or the international commons, by the introduction of wastes in excess of the carrying capacity of the affected resources as determined by applicable international scientific and ecomanagement standards; or

(b) changes the usual quantity or quality of a resource in a manner which cannot be ascribed to natural causes or processes, without regard as to whether the change is beneficial or adverse. 84/

SUBTASK THREE:

TO SUGGEST ALTERNATIVE METHODS OF DEALING WITH PROBLEMS A DEFINITION COULD CAUSE

23. The suitability of a definition, that is its quality in terms of policy scope and legal applicability, depends on

(a) whether the data base for the definition is complete,

(b) whether it is adequately expressed, with reasonable margins for expansion or modification of the empirical content,

(c) whether it is useful in the international law making process and its practical implementation.

The consultant considers the proposed text as one which represents an adequate beginning toward complying with specifications (a) and (b), and does not envisage at this stage any problems an adequate, comprehensive definition could cause.

Some recommendations

24. To enhance the quality of the definition and give it the authority which would promote its usefulness in the ultimate application--subparagraph (c) above--, it is recommended that

(a) the working inventories (principally that of natural resources and of transborder impacts) be widely circulated among natural resource experts for the purpose of supplementing or

modification;

(b) additional input by the Governments of specific instances of sharing and related problem solving be invited for the purpose of completing the inventory of shared resources and interests;

(c) permanent liaison be established among the data producers (FAO, WMO, WHO,etc.), the coordinating agencies (e.g., UN/CNRET), the ecomangement and the legal experts, for the purpose of continuous updating and tuning of the legal and administrative framework (see par. 5 above);

(d) the draft principles formulated by the IG be reviewed in the light of the definition which may be recommended for adoption;

(e) both the definition and the principles be interpreted and applied in the light of Principle 13 of the 1972 Stockholm Declaration--reflected also in draft principle 13 ("non-discrimination") as proposed at the fourth session of the IG[85]--concerning the implementation of the best national systems of ecomanagement, for these would simultaneously maximize beneficial transborder impacts of SNR and minimize or eliminate the adverse ones.

* * * * *

N O T E S

1/ Cooperation in the field of the environment concerning natural resources shared by two or more States. Report of the Executive Director. UNEP/GC/44 (1975); and follow-up documentation.

2/ E.g., General Assembly resolutions 2994, 2995, 2996 (XXVII).

3/ A/CONF.48/14, chap. I, II.

4/ UNEP/GC Decision 18 (II).

5/ UNEP/GC/44, cited fully in note 1.

6/ UNEP/IG.2/4 (1976); UNEP/IG.3/3 (1976); UNEP/IG.7/3 (1977); UNEP/IG.10/2 (1977).

7/ UNEP/GC/~~(III)~~ 55, chap. IX and decision 44; UNEP/GC/~~(IV)~~ 85, chap.I and decision 77; UNEP/GC/100, chap. VIII and decision 99 (V).

8/ The term paradigm is used here in the sense current in contemporary science: the set of concepts, premises, structural and functional relations, and methodology that guides a given field of endeavor. See T. H. Kuhn, The structure of scientific revolutions (Ed. 2, 1970); and, in a field closely related to the present subject matter, P. L. Johnson (ed.), An ecosystem paradigm for ecology (Oak Ridge, TN/USA, 1977).

9/ UNEP/IG.2/4, par. 16.

10/ Cf. UNEP/GC (~~III~~ 55), par. 411.

11/ This approach implements Recommendation 65, Stockholm Action Plan 1972, "to integrate the planning and management of natural resources"; in this perspective, law is the base of, and instrument for, management). See also, J. Mayda, The role of law and lawyers in the multidisciplinary task of management of the human environment: Theory, methodology, research needs. Report to the Colloquium of the International Association of Legal Science, Brussels 1972. The conception of ecomanagement was first proposed in J. Mayda, Environment & resources: From conservation to ecomanagement (1967, 1968). As an integrated model for the management of human ecosystems (that is, social systems within the framework of their environment resources), ecomanagement is distinct from the concept of ecodevelopment, current in the UNEP terminology since 1974 and aiming at the incorporation of "environmental considerations into development planning (see, for example, UNEP/GC/100, decision 100 (V), par. 1). However, such aspects of ecodevelopment as the advocacy of simple technology adjusted to a given society and its resources, are akin to the implications of the concept of the human ecosystem.

12/ For a comprehensive comparative statement see J. Mayda, Translator's introduction to F. Gény, Method of interpretation and sources of private positive law (1963) lii-lxxvi, further

developed by the same author in François Gény and modern jurisprudence, Essay III (EPD July 1978).

13/ See the apposite language in UNEP/GC (III), par. 410 (input of "environmental elements in the considerations of the International Law Commission). The widespread failure to follow the organic, nature-of-the-thing process in environmental law making, as well as in the doctrine and writing about environmental law, is discussed in J. Mayda, The penal protection of the environment (United States national report to the X. Congress of Comparative Law, Budapest 1978).

14/ The obligation to prevent is also expressed in the Charter of Economic Rights and Duties of States, Art. 30, General Assembly resolution 3281 (XXIX).

15/ This classification appears to be partly correctly stated, partly misrepresented in the discussion summarized in UNEP/GC/106, par. 406. Cf. the correct policy connotation in Id., par. 423.

16/ The empirical approach to defining, based on specific examples, is expressed in UNEP/GC/106, par. 408. But the more general tendency is toward descriptive or conceptual/nonempirical definitions as discussed in pars. 11 and 12 of the text above.

17/ UN/ECE (hydroelectric power development, water quality; 1950); E/Res. 417 (XIV) 1952 (development of contiguous water resources); FAO (1960s: shared uses of water resources in Latin America and in Africa); various agencies (from 1971 on: water resources common to more than one jurisdiction; resource development and meteorology; regional air quality; effects of interrelated natural resources on the welfare of other nations; pollution that may affect an internationally shared resource); Asian-African Legal Consulting Committee (the concept of "basin State," ;973).

18/ UNEP/GC/44, pars 7-9.

19/ UNEP/IG.3/3, par. 12.

20/ UNEP/IG.7/3, page 17.

21/ Revised Draft Convention on the conservation of migratory species of wild animals, Art. I, par. 1.

22/ UNEP/GC/44, par. 86.

23/ Colombia, Code of renewable natural resources and environment protection, Art. 11 (1974), cited in UNEP/GC/44, par.48.

24/ See note 20.

25/ For example, the definition referred to in notes 20 and 24, does not include <u>prima vista</u> highly migratory species, or air or water which transports wastes from one jurisdiction to another.

26/ In some fields, such as weather modification, sufficient data for the purpose of policy and law are expected to be available in the early 1980s.

27/ UNEP/GC/44.

28/ The broad term conservation needs to be distinguished so as to express two separate aspects: (a) environmental protection (Conservation I), (b) the traditional meaning, used especially in the petroleum sector, of extraction at some such rate as to prevent rapid depletion (Conservation II). This concept began to be synchronized recently with the development of substitute sources of energy.

29/ The term "harmonious exploitation" (resolution 3129) has not been given any interpretation (cf. note 27 above). Since the resolution makes a subsequent reference to the international aspect of harmoniousness ("normal relations between States"), the term harmonious must be understood as referring principally or exclusively to harmony with nature, that is good ecomanagement practices.

30/ Principle 9, Stockholm Declaration 1972.

31/ The comprehensive term (eco)management would gather and put better in focus the present terminological variety illustrated by the following sample: "rational development" (ECOSOC resolution 1212 (XLII), 1967), "planning, development and utilization" (The work of FAO in the field of natural resources. Report to the Third Session of the ECOSOC/CNR, 1972), "to increase production, conserve and manage resources, protect from pollution, undertake research and development activities" (Agreement on the Indo-Pacific Fisheries Coucil, Art. IV. FAO, Report on the Thirty-Fifth Session of the Committee on Constitutional and Legal Matters, Rome 1977, Appendix C; but see the shift to emphasis on "management and development," express inter alia in the same document, page 7, with reference to the IPFC agreement referred to above), "development, utilization and conservation" (various documents , among them, with a slight variation, UN/ESA, Management of international water resources: Institutional and legal aspects, ST/ESA/5, 1975, page 176), "exploiting, conservation, management, preservation" (Third Conference on the Law of the Sea. Informal composite negotiating text, 1977, Art. 56, dealing with the Extended Economic Zone), as well as

the terms of resolution 3129 itself--"conservation and harmonious exploitation." All these and similar terms are, in fact, various facets or consecutive phases of "integrated" (Recommendation 68, Stockholm Action Plan, 1972), "coherent" (Survey programme for the development of natural resources. E/AC.55/6. 1970), "ecological" (FAO/UNEP Conference on the ecological management of arid and semi-arid rangelands in Africa and the Near East. Working paper No. 9 [P.H.Sand] 1975), "ecosystemic," "rational" (various UNEP documents) environmental management--in brief, and with greater conceptual precision, ecomanagement.

32/ This is not to overlook the valuable classification effort in Natural resources development and policies including environmental considerations: Definitions and concepts. A background note by the Secretariat. E/C.7/2/Add.9, 1971. This document, which also confirms the interpretation of the scope of natural resources for the purpose of defining SNR (see par. 14(a) in the text above), has been incorporated in the present paper as far as applicable. See also the definitions and classification in the standard work by S. V. Ciriacy-Wantrup, Resource conservation: Economics and policies (Ed. 3, 1968).

33/ The terminological progression has gone from the term "international river" to "international (drainage) basin" to "international water resources system." First proposed in 1968, to "encompass atmospheric water and international frozen resources" not covered by the accepted meaning of international drainage basin, and to "take into account the interconnexion between water, other resources and the environment," the term "international water resources system" was retained in the final report, alongside the more restricted concept of international basin, to denote "a complete transnational, non-maritime hydrosystem." U.N. Department of Economic and Social Affairs. Management of international water resources: Institutional and legal aspects. ST/ESA/5, 1975, page 12 and Figure 1. The report also subdivides water in atmospheric, surface and groundwater (page 175). A classification related to surface inland waters is that of navigational and non-navigational uses (see, among other, Id., page 184, note 6). Both uses converge and blend when it comes to one of the key concepts underlying a definition of SNR -- transborder environmental impact.

34/ This term encompasses in its particular systemic framework some water, land and living resources. It also includes perforce the technological means and style of using these resources. This illustrates the difficulty of trying to define natural resources per se, rather than as a function of human ecosystems. But the terminology is justified not only because of the particular worldwide problems of food production, but also in the framework of the institutional logic of the United Nations system. When the present Committee on Natural resources and the Center for Natural Resources, Energy and Transportation began to develop, its jurisdiction was apparently defined to exclude agricultural resource systems, then already attended to by the FAO. See, ECOSOC resolution 1218 (XLII) 1967, giving the first ad-hoc committee the task to deal with minerals, water and energy resources.

35/ E.g., wilderness areas protected for scientific, genetic or scenic reasons.

36/ Fish, mammals, crustaceans, krill, plankton. The management emphasis ranges from preservation (mammals) to "harmonious" exploitation (fish) to great development potential (krill and other "unconventional resources). See Developments in the regime of the sea and their implications for fisheries. FAO Conference, Nineteenth Session. Doc. C 77/21, (Sept. 1977), pars. 21 ff.

37/ This includes resources under both land and continental shelf (including tidelands and territorial waters). Perhaps, the term subsoil, now used exclusively with reference to resources under the sea bottom, could be broadened into an all-comprehensive term. (In non-technical English, it has a dictionary meaning which refers only to land strata immediately below the surface. This terminology has been substantially broadened in the language of sea management and law.)

38/ The current terminology gives the false impression that renewable resources are not exhaustible. This is why the more technical-appearing, though common, terms flow and stock resources are preferable. See Ciriacy-Wantrup (cited in note 32) page 35.

39/ Air becomes a shared natural resource [SNR] when it acts as vehicle for the transport of wastes beyond national jurisdiction. Transborder pollution represents essentially a horizontal movement. When the transport of wastes is essentially vertical above national airspace, it can have impact on international commons in forms listed at notes 76 and 77. The interface between pollution originating within national jurisdictions and the global atmosphere and oceans in under study by the WMO, in cooperation with the UNEP and the IOC [Intergovernmental Oceanographic Commission]. WMO, Annual Report 1976, pp. 57-58.

40/ Cf. Recommendation 66, Action Plan for the Human Environment. A/CONF.48/14. 1972; and the following WMO publications: (i) W.W.Kellogg, Effects of human activities on global climate. Tech. Note 156 (1977); (ii) "Meteorological and hydrological aspects of nuclear power plant siting and operation," summarized in Twenty-Ninth Session of the Executive Committee (Geneva 1977) p. 55; (iii) Meteorology and desertification (Press summary, 1977).

41/ The relevant Stockholm 1972 Action Plan recommendations are: 25 (impact on the environment of changes in forest biomes), 38 (protection of ecosystems of international significance) and 60 (systematic audits of natural resource development in significant ecosystems). See also F. di Castri et al., "Biosphere reserves in the Mediterranean region," Nature and Resources XIII, 1 (Jan.-Mar.1977) 2f [published by UNESCO/MAB].

42/ Recommendation 39, Stockholm 1972 (sharing of genetic material). See the various reports of the International Board for Plant Genetic Resources (FAO) and the FAO/UNEP projects in the fields of animal, forest and fish genetic resources.

43/ The Informal Composite Negotiating Text, III. Conference on the Law of the Sea, A/CONF.62/WP.10, 15 July 1977 [LOS], Annex 1, lists sixteen marine species as"highly migratory". The FAO speaks of "multinational stocks": Fishery Committee for the East Central Atlantic, Report, Fifth Session (Togo, 1977) 39-41 [FAO Fisheries Report 195]. An example of interface between national resource utilization and migratory wildlife as a SNR is the Nigg and Udale Bays coastal nature reserve in Scotland, declared of international importance to migratory wildfowl by the official British Nature Conservancy Council (according to criteria laid down by the International Wildfowl Research Bureau), and the proposed nearby siting of the Niggs oil refinery. Nature Newsletter No. 77-8 (Council of Europe, August 1977).

44/ As an example of the proposed shared conservation, cf. Resolution 659 (1977) of the Parliamentary Assembly, Council of Europe, on the creation of marine parks in the Mediterranean, extending over the territorial waters of several countries. The problems of enclosed and semi-enclosed seas--defined in LOS, Art. 122, as "a gulf, basin, or sea surrounded by two or more States and connected to the opean seas by a narrow outlet or consisting entirely or primarily of the territorial seas and exclusive economic zones of two or more coastal States"--are likely to be affected by the legalization of the EEZ. See note 45.

45/ For the proposed regime of the exclusive economic zone see LOS, Arts 55-58 and Art. 76 (which extends the continental shelf to 200 miles "where the outer edge of the continental margin does not extend up to that distance"). Art. 58 deals specifically with rights and duties of other States in the EEZ, and the relations between them and the coastal State. It is expected that the EEZ regime will favor management (in the full sense of "conservation and harmonious exploitation") of that part of the oceans, which yield approximately 90 per cent of marine fish production. See Developments in the régime of the sea and their implications for fisheries. Conference FAO, 19th session, Rome 1977. Doc. C 77/21, para. 11.

46/ According to the present state of the art in hydrogeology, all the known major aquifers in the world down to 1000 m have hydrologic gradients. However, the local condition of permeability of the underground rock varies greatly, and with it the effect of fresh water mining on nearby regions which may be across the State border. All good aquifers are considered site-specific. The widely used term fossil water is considered technically incorrect. (Private information.)

47/ In the accepted technical sense, a mineral is "a [natural" solid...generally...inorganic." Encyclopedia Britannica 12 (Ed.15, 1974) 233. This is the meaning current in the U.N. and other international documentation (e.g., ECOSOC/ Committee on Natural Resources. Report on the First Session, 1971; Recommendation 56, Stockholm Action Plan, 1972; IUCN, List of natural resources: "minerals" distinguished from "fossil organic substances"; UNEP/ENVED 8, 1977, par. 45, distinguishes mineral and energy resources), as well as in scientific literature (see, for a recent instance, Science 198 (25 November 1977) 811: fuels- and nonfuels mining). Ambiguous or inconsistent usage, for instance, the distinction between petroleum and other energy resources (Natural Resources Forum [UN/ESA] I (1971) Foreword) or terminology such as "nonfuel mineral resources," appears to be sanctioned in LOS, Art. 133--though only for the purpose of the particular part of the treaty dealing with "mineral resources...recovered from the Area (see the definition in note 80): "...such resources shall...be regarded as minerals [and] shall include ...liquid or gaseous substances such as petroleum, gas...."

48/ Although categories XIII to XV in Figure 2 are all energy sources, it appears convenient to separate coal as a solid from liquid and gaseous energy resources, for the only known problem in sharing coal is access (see note 56). The similarities between the mining of coal and of other minerals have not been overlooked, inclusive of the impact of open-pit mining. These consideration do not preclude the suggested division along the generally accepted classification lines between minerals and fuel resources. The ocean thermal energy conversion (OTEC) technology has not been included in the inventory, although it will be on line within the foreseeable future, since practical considerations limit OTEC to territorial waters and there are no estimates of climatic impact (the cooling of the ocean surface) which might affect the territory of other State or States.

49/ Oil exploitation at sea suggests an activity-impact relation contrary to air (note 39 above): while the local impact of an accident is vertical (oil rising to the surface, the spread of the pollution affecting other States and the international commons is perforce horizontal.

50/ There are seventeen geothermal power plants in the world, the oldest in Larderello (Italy, 1904- , 380 MW), the most powerful at Geysers (USA, 1960- , 502 MW). This is not a well explored field in terms of energy potential as well as environmental impact, inclusively transborder. Cf. Natural Resources Forum I (1971) 176; Western energy resources and the environment: Geothermal energy. U.S. Environmental Protection Agency. Publ. 600/9-77-010/PDS 3869, 1977. LOS, Art. 133, classifies undersea geothermal energy as a mineral (see note 47).

51/ For the meaning of the terms Conservation I and Conservation II (the penultimate item in the column "Shared interest") see note 28.

52/ A list of multiple uses of water is in Committee on Natural Resources, Report on the Second Special Session, ECOSOC Official Record, Sixty-third Session, Supp. 2, Annex IV (1977).

53/ The reference here is to disasters (thus the association with weather, surface water, land, and sea), not to survival.

54/ Includes exploration for the purpose of exploitation. Not explicit in Figure 2 is tourism as a potential shared natural resource interest. See note 72.

55/ The term production was proposed as more appropriate than exploitation in the Report of the Committee on Constitutional and Legal Matters, FAO Council, Seventieth Session (Rome 1976), Doc. CL 70/5, with reference to Agreement for the Establishment of a General Fisheries Council for the Mediterranean (GFCM), Art. IV, par. (a).

56/ See as examples the Saar area (access through the territory of another State) and the recent agreement between the Federal Republic Germany and the German Democratic Republic (joint exploitation). Both situations are related to coal deposits.

57/ Limitation of impact to "significant," meaning not de minimis, was proposed and considered in the course of previous meetings of the IG (UNEP/IG.3/3, page 7, note 7; UNEP/IG.7/3, page 17). The corresponding French term "notable" is perhaps more adequate. This terminology leaves aside the more damaging--because not immediately "significant/notable" nor quantifiable--longer-term, cumulative or synergistic impacts. While the present data are not sufficiently complete (the 1977 amendments to the U.S. Clean Water Act of 1972 created a new category of "nonconventional" pollutants, i.e., chemicals whose toxicity is yet to be determined), the correllation between high level of pollutants, long-term cumulative effects on humans, and environmentally caused cancer has been established beyond any doubt. The average lead time ranges between fifteen and twenty-five. See also note 61.

58/ There can be also "transborder" impact from the international commons on State territory. See notes 78 and 80.

59/ A possible comprehensive classification of pollutants is this: (a) chemical (organic, unorganic); (b) physical (dust, heat, noise, radiation, radioactivity); (c) biological (bacteria, viruses, pests, parasites).

60/ On "acid rain," which appears to be the major transborder problem of chemical air pollution, see The OECD programme on long range transport of air pollutants (Paris 1977) and the UN/ECE European research and monitoring project on the long range transmission of air pollutants. Cf. also the related activities of the WMO Committee on Atmospheric Sciences (next meeting slated for Manila, February 1978).

61/ The problem is summarized in The State of the Environment: Selected topics - 1977. Report of the Executive Director. UNEP/GC/88, 14 March 1977.

62/ Involved are intentional activities such as cloud seeding, the combating of hail, fog dispersion and moderation of tropical storms. The problems and the state of the art are outlined in the following WMO documents: (i) Report of the WMO/UNEP informal meeting on legal aspects of weather modification (Geneva 1975); (ii) WMO Weather modification programme (Press release 313, 1975); (iii) Plan for the precipitation enhancement project (Report No. 3, 1976); (iv) Register of national weather modification projects (1976), based on the reports from 54 countries.

See also UN/ESA (cited in note 33), pars. 33-37, and the bibliography there. The major data gathering projects have been GATE (tropical Atlantic, 1974) and the ongoing Equatorial Shuttle Experiment (tropical Pacific).

63/ Referred to also as "[sudden] grave natural events" (see Draft Principles of Conduct, (9) Emergency action. Doc. UNEP/IG.10/2, 3 October 1977, p. 9). The term "natural disasters" (UNEP/GC/106, 20 June 1977, para. 220) appears to include also earthquakes. Thus it has a broader meaning

than the term "biospheric disasters" used here. The goal of protection of the human ecosystem ("to avoid loss of life") was explicitly mentioned in the discussion (ibid.).

64/ Flood warning appears to be one of the more fundamental examples of a shared responsibility to exercice preventive control and emergency measures with regard to a shared resource. See the legal norms proposed by the International Law Association (1972) in UNEP/GC/44, 20 February 1975, para. 58.

65/ On the definition of insects as natural resource see Natural resources problems and issues. Note by the Secretary General. Doc. E/C.7/2, Addendum 9, 17 February 1971. The definition of pest is in the International Plant Protection Convention, Proposed Amendments and Modifications, Art. II (2). Report of the CCLM, FAO Council, Seventy-Second Session (Rome 1977), Appendix D.1. An institutional example is the Desert Locust Control Organization for East Africa.

66/ See Recommendation 48 (c), Stockholm 1972, on "unregulated unilateral action" which results in "the invasion of international waters by certain exotic species."

67/ The area of shared water resources appears to be among the best internationally regulated, particularly through the various international river basin commissions. The Senegal River Commission agreement goes as far as to stipulate joint ownership and management of all physical works that affect the water flow in the basin.

68/ See Recommendations 85 and 86, Stockholm 1972.

69/ Recommendation 86 (f), Stockholm 1972, addresses itself particularly to pollution of enclosed and semi-enclosed seas from land-based sources, including thermal pollution ("residual heat from nuclear and other power stations"). Not every thermal impact is pollution in the negative sense. It can be beneficial for fisheries.

70/ Soil erosion, as well as thermal impact, can be to some degree beneficial for fisheries. The FAO lists the degradation of soil resources only in the fourth place among the agency's priorities (the first three are: fish, water, wildlife). The global problem is surveyed in The State of the environment 1977, UNEP/GC/88, para. 50-62.

71/ See the WMO publications in note 40, (i), (iii) above; J.A. Mabbutt, "Climatic and ecological aspects of desertification," Nature and Resources XIII, 2 (Apr.-June 1977) 3; UNESCO/MAB Final reports 29, 30 (1975); FAO/UNEP Conference on the EMASAR (cited in note 31, in fine).

72/ The item "amenities" is intended to include, among other, tourism resources [cf. the General Assembly resolution 2529 (XXIV) and ECOSOC resolution 1540 (XLIX)], recreation and scenic resources (cf. the proposal of the Soviet Union that landscapes be included, together with endangered species of plants and animals, in the agenda of a future high-level meeting on environment problems in the ECE region. Consultative meeting, Senior Advisers to the ECE governments on environment problems (SAEP), Geneva, 19-21 September 1977.)

73/ See LOS, Arts. 61, 66, 67 (interface national resources/ international commons: subregional, regional and global minimum standards for exploitation, based on the best scientific evidence available; management of anadromous and catadromous species, including the assurance of ingress and egress and interstate obligation to cooperate). Cf. Report on FAO, the FAO Committee on Fisheries and international and regional fishery bodies. Doc. FID/C/331 (1975) para. 16.

74/ See International Hydrological Programme, Project No. 8.1: Physical and methodological models for investigation and prediction of changes in groundwater régime due to human activitity, outlined in Nature and Resources, XIII,1 (Jan.-Mar. 1977) 27-28.

75/ Salinization is saltwater intrusion into freshwater aquifers, the level of which was lowered by excessive water mining. It occurs often but not exclusively near the coast.

76/ See The state of the environment 1977, UNEP/GC/88, para. 12-32; WMO, Statement on modification of the ozone layer due to man's activities. Press release 315 (1976).

77/ The best recent synthesis of the problem is by R.A.Kerr, "Carbon dioxide and climate: Carbon budget still unbalanced," Science 197:1352 (30 September 1977). The problem is due to (i) the great increase and concentration of the use of fossil fuels since a monitoring program began in 1958, (ii) progressive deforestation, especially also in tropical regions, (iii) lowered estimates of the capacity of the ocean to absorb CO_2. See also Science 199(20 January 1978) 253-58; Scientific American 238 (January 1978) 34-43.

78/ An example is the impact of a nuclear-powered satellite on a State territory as the result of an uncontrolled reentry.

79/ Concerned with the fact that river pollution ends in the ocean, the Stockholm 1972 conference recommended (No. 55) the establishment of a world registry of clean rivers and a commitment by the States to bring polluted rivers up to defined quality standards by a target date. Cf. also Committee on Natural Resources doc. E/C.7/2, Addendum 8, para. 3 (1971) and Id., Addendum 6, where the Secretary General proposes "a new relationship...of the river to the ocean and not only the relationship of the activities of one country to the other concerning one river." Some of the worst polluting rivers, including those which flow into enclosed seas, are uni-national.

80/ In LOS, "Area" means the sea-bed and ocean floor and subsoil thereof beyond the limits of national jurisdiction; and "activities in the Area" mean all resource exploration and exploitation (Art. 1). Protection of the marine environment, "including the coastline," is stipulated in Art. 145.

81/ For a comparison of the provisions of various conventions, as well as of the LOS negotiating text, see FAO Legal Office, Background paper No. 9 (P.H.Sand), 1975.

82/ Some of these concepts are incorporated in draft-principle (9) "Emergency action" (UNEP/IG.10/2, page 9, 1977). See also note 64.

83/ See the emphasis on shared management in the recent FAO documentation cited above; the implication of this concept in the call for "macro-economic studies on both global and regional levels" (FAO, Report of the Eleventh session of the Committee on Fisheries, Rome 1977); the call for the application of "socially optimal technologies" in water resources management, with obvious implication for all SNR (Natural Resource Forum, I, 2 [1977]); LOS, Arts. 66 (4), 67); the conception of "ecological good-neighborliness" (UNEP/GC/44, para. 64), etc.

84/ The fact that "conservation and harmonious exploitation" of a SNR can also have beneficial transborder effects should be a foremost consideration of international ecomanagement policy and practice. It certainly falls within the scope of "shared interest" as developed in this paper.
For the purpose of legal adoption and implementation, however, the concept of beneficial impact should be made explicit only if one wishes to propose (a) the obligation to generate beneficial impact and (b) a corresponding duty of the beneficiary State to compensate the benefactor State for calculable costs of the benefit generating activity or abstention.

85/ UNEP/IG/10/2, pages 11-12.