The earliest cases and treaties in international environmental law concerned instances of transboundary pollution. We begin, accordingly, with a debate over the implications of one of the leading cases in this area, the Trail Smelter Arbitration. This is followed by related discussions concerning the conflict between source and victim state sovereignty, the threshold of cognizable injury, and the various tort standards of liability.

While the Trail Smelter Arbitration set a precedent in transboundary air pollution, other kinds of transboundary pollution have deviated in minor ways from that precedent. Accordingly, we include essays on transboundary river pollution and pollution of transboundary groundwater aquifers.

Much of the legal development in the area of transboundary pollution has concerned procedural obligations. The next section of this Chapter reviews these obligations and raises the question of their efficacy.

Certain regional arrangements have pioneered the allowance of domestic tort remedies for foreign victims of transboundary pollution. The first essay in the final section of this Chapter discusses this alternative approach. The concluding essay proposes the general creation of bilateral market mechanisms to control transboundary pollution.

A. State Liability: Theoretical Issues

1. Accommodating Source and Victim State Sovereignty

In the case concerning the legality of French atmospheric nuclear testing in the South Pacific presently before the International Court of Justice, an issue has been raised of far-reaching implications for the general law of state responsibility for environmental damage.

In the Australian application (reference to which will suffice in this context in view of the almost identical nature of the New Zealand application), the Court is asked for a declaratory judgment that the carrying out of further atmospheric nuclear weapon tests in the South Pacific Ocean is not consistent with the applicable rules of international law. Additionally, the Court is requested to indicate a permanent order restraining France from carrying out further such tests. The application itself is based on essentially three arguments, namely the illegality per se of atmospheric nuclear testing, the illegal infringement of the freedom of the high seas, and the violation of Australian territorial sovereignty as the result of radioactive fall-out from the French tests.

The listing of this latter argument as a ground separate from that of the illegality per se of atmospheric nuclear testing, “as sufficiently comprehensive and strong to bear the whole might of the contention that the conduct by France, of atmospheric tests violates Australia's rights under international law” deserves special attention because it raises a basic question: To what extent do extraterritorial effects of a state activity lawful per se give rise to state responsibility? For indeed, the implication of this Australian argument in its limited context—i.e., apart from the other two arguments put forward—is the existence of a dispute arising from the exercise of equal sovereign rights defined in terms of territory: the right as France sees it to carry out activities lawful per se in its own territory as the essential consequence of its sovereignty; and the right that is being claimed by Australia to determine itself what acts may take place within its territory, based on the very same notion of sovereignty.

a. The Scope of Territorial Sovereignty

It is nowadays accepted as an undeniable fact that the earth's biosphere represents a single indivisible system characterized by the interrelation of its various functional and ecological subsystems, the disruption of any one of which promotes the breakdown and destabilization of another. In view of this ecological interdependence, limited international minimum standard setting for the protection of the environment appears to be highly desirable as well as practicable. Not surprisingly, however, progress in this respect has been slow and largely limited to the enactment of standards and criteria devised to protect what may be identified as the “internationally shared environment.” The diversity of national economic, social and environmental circumstances is such that uniform eco-standards, which in themselves would constitute the basis of a state's easily ascertainable obligation to refrain from conduct affecting another state's environment have as yet hardly materialized and will remain most difficult to agree upon in the future. In the absence of binding standards either of general or particular applicability, the concept of territorial sovereignty has hitherto remained the principal starting point in the consideration of principles of state responsibility for conduct entailing extraterritorial environmental effects upon other states. Thus even though other approaches to the question of state responsibility for extraterritorial environmental interference, such as a human rights perspective, are conceivable and may become feasible in the future de lege lata it is still the sovereign right to territorial integrity which serves as the primary legal defense of a state affected by transnational pollutants.

Principles of international law relating to the conflict of equal rights directly connected with the use of
The emerging principle of *sic utere tuo ut alienum non laedas* constituted recognition of the fact that territorial sovereign rights in general were correlative and interdependent and were consequently subject to reciprocally operating limitations. This rejection of the absolute view of sovereignty was an acknowledgement of the fact that activity within a state’s territorial bounds ceased to be within the exclusive competence of that state and became instead a matter of international concern, if such action caused transnational effects. Today the maxim of *sic utere tuo* ‘runs through the range of state-to-state relationships’ and has been epitomized by the ICJ in the *Corfu Channel* case as ‘every State’s obligation not to allow knowingly its territory to be used contrary to the rights of others.’

Various concepts have been put forward as the theoretical legal basis of the maxim as an explanation of the restraints upon the exercise of territorial rights such as the doctrine of abuse of rights, the concept of ‘good neighborliness,’ and even the notion of international servitudes.

The latter–apart from the basic question whether it has a proper place in international law at all–seems already *per definitionem* inapplicable to the circumstances of an international conflict arising out of transnational effects of a state activity lawful *per se*. The concept of ‘neighborliness’ on the other hand, must be seen as part and parcel of what has been called ‘one of the basic elements of the international law of torts,’ i.e., the principle of abuse of rights. For the notion of ‘neighborliness’ simply implies that the exercise of sovereign territorial rights, as indeed of any rights, cannot be separated from the social context in which the rights are being asserted and that it is only in the concrete circumstances of a specific situation that rights may find their exact delimitation. From this it follows logically that where, in the context of an international society based on the sovereign equality of states, the exercise of a sovereign right is bound to conflict with similar rights of an equal rank, insistence on individual rights must be considered unreasonable and reprehensible. The concept of ‘neighborliness’ is thus but the factual background against which the exercise of territorial rights must be seen. It does not constitute an independently existing body of specific legal rules imposing restraints on the exercise of territorial rights but merely represents an expression of the principle of abuse of rights.

At this point it is necessary to refer briefly to the recent discussions of the International Law Commission on the determination of the premises of international responsibility during which the prohibition of abuse of rights has again been the subject of special attention. On the one hand, it was argued that the principle was to be regarded as a special source of state responsibility particularly in situations where ‘there is no clearly defined interaction of rights and obligations and the rights remained undivided in the law.’ On the other hand, in his reports on state responsibility, the Commission’s Special Rapporteur on the topic, declared that the prohibition of abuse of rights could be accommodated in a ‘primary rule’ of international law to the effect ‘that States were under an international obligation not to exercise their rights beyond a certain limit.’ The constituent element of a wrongful act would therefore ‘still be represented by the violation of an obligation and not by the ‘exercise of a right.’”

Whatever the merits of these differing approaches to abuse of rights as a source of international responsibility may be, both approaches demonstrate the need to isolate the basic and typical elements, the convergence of which in a clash of sovereign territorial rights, will normally entail a state’s international responsibility. For the doctrine of abuse of rights serves simply as a general principle of interpretation, a ‘method of approach to legal rights and duties.’ It does not in itself provide an answer to the actual extent or nature of the rights under examination but is limited to the stipulation that the right ‘must not be used in such a manner that its anti-social effects outweigh the legitimate interests of the owner of the right.’ Similarly, to state that international responsibility arises from conduct attributable to and constituting a failure of a state to comply with an international obligation, including one that incorporates the concept of abuse of rights, simply begs the question of what the obligations of states are in a specific class of interests in which the same legal justification, territorial sovereignty, is invoked by both parties. Even if on the international plane any violation of an obligation can be equated with an infringement of a corresponding subjective right, in such a situation it is still the very scope of the obligation, that is, the duty of abstention, which is unclear and hence also the scope of the correlative right that is affected.

b. The Role of Injury in Cases of Extraterritorial Environmental Effects

The question whether injury is an element to be taken into account in defining, in principle, the conditions for the existence of an act or omission which entails state responsibility was extensively discussed within the International Law Commission, in particular in the course of its deliberations of what was then draft Article 2 on state responsibility. The problem raised was whether draft Article 2, Paragraph (b) on the ‘objective element’ as a condition for the existence of an internationally wrongful act, namely ‘failure to carry out an international obligation of the State,’ was sufficient in itself or needed further elaboration by reference to ‘injury.’

The omission of reference to injury as a condition for state responsibility presupposed that the violation of an obligation involved a moral injury. The fundamental question is therefore: Can proof of the existence of
extraterritorial environmental effects caused by a state activity lawful per se be equated with proof of the infliction of a moral injury—a violation of sovereignty—on the affected state? Does such activity, therefore, give rise to liability upon proof of the simple fact of a transfrontier crossing of pollutants? Or is material damage consequential to such crossing the precondition for state responsibility?

Case law and state practice together provide the answer in the form of a rejection of the concept of moral injury in this sense as a sufficient ground for international responsibility, when the pollution generating conduct is not governed by a specific rule of international law.

(1) Judicial Precedents

Consideration of the case law takes us to what has been considered the locus classicus of international legal principles on transnational pollution, the Trail Smelter arbitration between Canada and the United States.9

The importance of this decision clearly lies in its uniqueness in laying down principles of liability for transnational air pollution. However, a major caveat has to be added at the outset. Any evaluation of the case must take due cognizance of the fact that the tribunal was required to apply "the law and practice followed in dealing with cognate questions in the United States of America as well as international law and practice," and that the tribunal did not consistently interpret its powers under the compris.

In the second phase of the case, the tribunal, in a broad pronouncement as a principle of general international law, held that "...no State has a right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence." Having affirmed the existence of damage caused by the Trail Smelter in the State of Washington in its 1938 decision, the tribunal gave the following answer to the question whether the Trail Smelter should be required to refrain from causing damage in the State of Washington in the future and if so to what extent.

So long as the present conditions in the Columbia River Valley prevail, the Trail Smelter shall be required to refrain from causing any damage through the fumes in the State of Washington; the damage herein referred to and its extent being such as would be recoverable under the decisions of the courts of the United States in suits between private individuals.

Some confusion surrounds the tribunal's use of the terms "injury" or "damage" ("damage" being the term the parties preferred to "injury") and "damages" in the sense of indemnities. Once that is sorted out, however, the result in the form of general principles of international law is less than one might have expected. The only certain conclusion inferable from the tribunal's holding is, that under international law a state has to tolerate the consequences of the activities of another state affecting its territory which are lawful per se so long as these extraterritorial effects do not amount to an injury and the case is not of serious consequence. Although, to be sure, "injury" must be established by clear and convincing evidence, no further substantive qualifications can be inferred with certainty from this decision. Thus the essential question of whether "injury" means material damage only or includes moral damage as well has not been dealt with conclusively.

In its 1938 decision the tribunal rejected a US claim for "damages in respect of the wrong done to the United States in violation of sovereignty." The only item that had been put forward by the United States under the claim for damages for "violation of sovereignty" was one for money expended "for the investigation undertaken by the United States Government of the problems created in the United States by the operation of the smelter at Trail." Basing its interpretation on the travaux preparatoires of the compris, the tribunal concluded:

it was not within the intention of the parties, as expressed in the words "damage caused by the Trail Smelter" in Article III of the Convention [compris] to include such moneys expended . . . Since the United States has not specified any other damage based on an alleged violation of its sovereignty, the Tribunal does not feel that it is incumbent upon it to decide whether, in law and in fact, indemnity for such damage could have been awarded if specifically alleged.

Obviously then, the tribunal rejected the claim of the United States because it considered that the item put forward under the heading of "violation of sovereignty"—the money expenditures incurred as a consequence of the alleged violation of sovereignty—did not qualify as "damage" under the terms of the compris. The tribunal did not consider and consequently did not reject a claim for moral damages based on a violation of sovereignty. Instead it was simply called upon to consider the alleged material damage, the monetary "loss" incurred by the United States, as a consequence of an alleged violation of sovereignty and concluded that "the Convention [did] not warrant the inclusion of the cost of investigations under the heading of damage." No inferences can, therefore, be drawn from this rejection of the US claim as to moral damage.

The argument has been advanced, however, that in the Final Decision of 1941, "to the extent the tribunal construed its pronouncements into exclusive statements of general international law applicable to the affair . . . the
the indication is that in a situation of the former category liability arises without proof of material damage while in

Undoubtedly, this second difference is the decisive one. As to the consequences of a violation of sovereignty, the indication is that in a situation of the former category liability arises without proof of material damage while in
the situation of the latter type, e.g., a case of transnational pollution, state responsibility can only arise upon proof of material damage.

State practice quite unambiguously corroborates this conclusion.

(2) State Practice

In the highly decentralized international legal system where states are both the creators and addressees of norms, the line between state practice as evidence of an international custom within the meaning of Article 38 of the Statute of the ICJ and as evidence of the process of formation of such a custom is necessarily fluid. The essential difference, of course, lies in *opinio iuris,* “the belief that this practice is rendered obligatory by the existence of a rule of law requiring it.”12 Ascertaining the existence of that principal element of custom is often a formidable task. This is particularly true for certain resolutions or declarations passed by international organizations or intergovernmental conferences which, under the constitution of the body concerned, normally represent only recommendations or statements of principles of a nonbinding character. Irrespective of the legal status of such a document under the constitution, it may be that the resolution or declaration concerned must be considered as amounting to a clear expression of *opinio iuris* and thus having a binding effect.

Some of the principles contained in the Declaration of the United Nations Conference on the Human Environment, such as Principle 21 on state responsibility for extraterritorial environmental damage, may be instances in point:

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or areas beyond the limits of national jurisdiction.

In the light of the object and purpose of the whole Declaration and the history of the drafting of the above principle, it is obvious that Principle 21 can only be understood as referring to material damage alone, and that it thus confirms that material damage is the precondition for a state's responsibility arising out of an activity lawful *per se*.

Although there have been cases in which resolutions or declarations have, in the absence of prior state practice, created law and therefore amounted to genuine acts of international quasi-legislation, the basic concept of responsibility embodied in Principle 21 is certainly founded on what today must be considered a well-settled state practice, at least in the field of water pollution.

Article X of the so-called Helsinki rules adopted by the International Law Association at its Fifty-Second Conference espousing the principle of equitable utilization of the waters of an international drainage basin as the basic rule, stipulates that a state, in accordance with this rule,

(a) Must prevent any new form of water pollution or any increase in the degree of existing water pollution in an international drainage basin which would cause substantial injury in the territory of a co-basin State, and

(b) should take all reasonable measures to abate existing water pollution in an international drainage basin to such an extent that no substantial damage is caused in the territory of a co-basin State.

“Water pollution” being defined as “any detrimental change resulting from human conduct in the natural composition, content, or quality of waters,” it is apparent that according to the Helsinki rules only material damage can be the basis of a state's liability in a case wherein activity lawful *per se* brings about the pollution of the waters of an international river basin.

The principle of material damage as the precondition of state responsibility in such a case has in a similar way been implicitly affirmed by the Institute of International Law at its Salzburg session, in Draft Propositions formulated in 1973 by a Standing Sub-Committee of the Asian-African Legal Consultative Committee, and in an Inter-American draft Convention on Industrial and Agricultural Use of International Rivers and Lakes. It is expressly adopted in a 1969 European draft Convention on the Protection of Fresh Water against Pollution; it is a cornerstone of such agreements as the Boundary Water Treaty of 1909 between the United States and Great Britain, the Netherlands-German Treaty on Boundary Questions of 1960, and constitutes an essential feature of the legal regime applicable to the Indus River system and to frontier waters shared by socialist states, to mention only a few examples.

Air pollution as an international problem is not confined to a regional context of highly industrialized border areas where the transfrontier pollutants affect contiguous countries. Atmospheric conditions and the nature of the pollutants concerned may be such as to involve countries not in the immediate proximity of the pollution source. So far, however, state practice in the field has been fairly limited and probably would not yet in itself afford a basis upon which one could determine exactly the conditions in which states would generally be considered responsible for transnational air pollution originating from their territory. In the case of long-range transport of pollutants, the
still rather tentative nature of scientific conclusions, in particular with regard to flow-patterns, may account for the hesitancy in bringing the matter up on a diplomatic level. Moreover, regional transboundary air pollution practice appears to have been virtually limited to problems arising in North America.

In the light of the foregoing considerations it is a legitimate inference that injury in the sense of material damage is the foundation of state responsibility in cases where a state activity lawful per se entails extraterritorial environmental effects. The mere fact of the "violation of sovereignty" implicit in the transfrontier crossing of pollutants is thus insufficient to render a state liable for the activity generating the pollutant. Or rather, the transfrontier crossing of pollutants does not in itself amount to a violation of sovereignty, the infliction of a legal injury which could be the basis of the polluting state's liability vis-a-vis the affected state.

2. Threshold Of Cognizable Injury

Over the last few years the question of a state's entitlement to the use of environmental resources entailing transboundary effects has tended to be analyzed in terms of the legal implications of the notion of 'shared natural resources.' Today it is generally accepted that if a utilization of a natural resource in one jurisdiction affects a similar or different utilization in another, states are subject to mutually operating restraints as a matter of customary international law. A state's entitlement to the use of a natural resource is circumscribed by the obligation to avoid infliction of harm to other states. There is a general consensus, however, that not each and every transboundary impact is to be avoided. The international legal threshold of impermissible natural resource use will be deemed transgressed only when 'serious,' 'significant,' or similarly qualified transboundary effects occur.

The customary entitlement thus characterized remains admittedly ambiguous. Transboundary 'injury,' without more, is a relative notion. Its vagueness is compounded by the additional qualification of 'significant.' In the assumed absence of applicable eco-standards which would provide a ready indication of whether certain transboundary environmental effects amount to legally relevant transboundary harm, the question of the outer limit of a state's right to the use of an international air shed turns on the notion of 'significant injury.' There exists, of course, extensive state practice which bears directly on the notion of 'significant injury.' But the characterization of the threshold impact of transboundary air pollutants has ranged from 'injury to health and property' and the destruction or the endangering of forests, to mere 'inconvenience or discomfort.' Any attempt, therefore, at distilling a single abstract threshold concept of general applicability from state practice is an exercise in futility.

It is, quite simply speaking, 'impossible to formulate a general rule of international law fixing a level at which the damages produced by transfrontier pollution can be deemed to be substantial,' hence to have reached the level at which the acting state's claim to the use of the shared air shed is no longer justifiable. This impracticability is, of course, explained by the fact that 'significant injury' has traditionally been understood to signal 'legally significant injury' rather than a mere factual finding of a not insubstantial transboundary impact. As a term of art, the concept has been taken to suggest injurious transboundary effects due to what, in the circumstances of the case concerned, is unreasonable conduct on the part of the source state. The reasonableness of the source state's conduct, in turn, is determined by way of an analysis in which the injurious transboundary impact of the incriminated conduct is one among a number of factors to be taken into account. Thus the essence of the process by which the point of 'intersection of harm and wrong' is established in a situation in which the parties' rights and obligations are a priori indeterminate, has been considered to be a balancing-of-interests of the states concerned.

This conceptualization of the threshold issue is not only inherently reasonable, given the fact that the international dispute concerned involves a clash of basically equally ranking sovereign rights of states, but also well grounded in contemporary international legal practice. Few experts would disagree with this conclusion. Opinion, however, is sharply divided on the normative implications of an affirmative finding as to that key criterion in the multiple-factor analysis, significant transboundary harm. On the one hand, it is increasingly being asserted that any 'significant injury' in fact equals 'significant injury' at law. In other words, the occurrence of significant, in the sense of not insubstantial, transboundary harm associated with one state's use of an internationally shared natural resource indicates, it is claimed, in and of itself an internationally impermissible use by the source state. On the other hand, there is a strong opposing school of thought which is backed by evidence of past international legal practice, and might derive some support from recent developments within the International Law Commission. The thrust of its argument is that a finding of significant transboundary harm alone is not a sufficient indicator that the causal state's conduct is internationally impermissible. For such a judgment to obtain, it must be accompanied by a correspondingly qualified finding at law, by evidence that, factually significant as it may be, the transboundary injury involves an inequitable use of the shared natural resource.

The question raised is, therefore, whether today the outer limit of a state's entitlement should be and, if so, actually is, circumscribed in terms of a not insubstantial transboundary impact to be avoided or, whether such an
impact notwithstanding, it can be defined only by reference to additional considerations, in particular the value of the transnationally injurious conduct to the source state. More specifically, the question is whether or not, as a general rule, a victim state might be obliged to tolerate significant environmental degradation due to transboundary air pollution as long as such pollution amounts to the use of an equitable share of the air shed by the source state.

The `dual test theory' regarding the international impermissibility of transboundary polluting activities, as reflected in the requirement of not insubstantial harmful effects and inequitable resource use, gives expression to a mix of efficiency and distributional considerations. While the `right mix' of efficiency and distribution is a matter of fundamental importance in any legal system, it need not be of specific concern in the present context. Suffice it to say that the interpretation of the equitable use principle as involving a dual test approach appears fundamentally flawed. For such interpretation may neither serve efficiency in the long run nor be justified on distributional justice grounds.

Perhaps first and foremost `equitable use' implies a call for the maximization of the aggregate utility of the internationally shared natural resource. This objective is realizable only to the extent that a comparative judgment on marginal pollution prevention costs vs. marginal pollution costs is reasonably accurate. It is, however, a truism that pollution prevention costs, including so-called opportunity costs, are relatively easily assessable, whereas the same cannot be said of pollution costs. Indeed, the latter are notoriously difficult to gauge accurately. In a legal system which, as a general rule, permits the trade-off of social/economic interests of one state against infliction of significant environmental harm in another, the risk of a miscalculation is thus considerable.

Any deleterious environmental effects are likely to threaten a whole range of values that depend on the preservation of environmental resources, such as wealth, public welfare, and the like. Therefore, a significant deterioration of environmental quality will not only produce significant secondary and tertiary effects, but also effects of a kind that may well be experienced--but not necessarily understood as such--over considerable space and time, given regional and global ecological interdependencies and all too frequently encountered difficulties in reversing environmental harm. This is particularly true of effects produced by air pollutants. In view of the difficulties in appreciating the true repercussions of permitting significant transboundary environmental harm, let alone in putting a value on the latter, the dual test approach thus represents a blueprint for a transboundary resource allocation which more likely than not will turn out to be an inefficient one.

The dual test approach is equally unacceptable from a distributional justice point of view. To be sure, it has been argued--most recently within the International Law Commission--that a delimitation of the international entitlement in the sense of protecting an exposed state against significant environmental injury, or conversely of limiting the polluting state to transboundary effects below the threshold irrespective of potentially countervailing interests, is inherently unfair. Such a view of the entitlement, it is contended, pits the `haves' against the `have-nots.' It is, so it is claimed, antagonistic to the latter's attempts at reaching an adequate measure of industrial and social development by denying them the right to an equitable share of internationally shared natural resources.

There can be little doubt that the narrowing of the North-South gap is at least in principle acknowledged to be a critically important objective of international public policy. To promote this objective, an exceptional derogation from what remains an avowed fundamental tenet of the international legal system, the sovereign equality of states, is certainly conceivable. An international allocation regime that encourages socioeconomic advances in developing countries, though perhaps at the cost of significant extraterritorial environmental harm, might accordingly appear justifiable in terms of overall community policy. The non-compensable significant transboundary harm might be deemed a form of payment, or development aid, to the developing polluting state. However, there are important reasons why this view of the entitlement should prove internationally unacceptable.

To begin with, it is disingenuous to emphasize opportunity costs associated with the stricter test without taking into account as well that developing countries are increasingly also the beneficiaries of a narrow reading of polluting states' international entitlements. More importantly, the argument in support of the dual test approach appears inconsistent with international public policy. The very real opportunity costs that might result from a generally narrow definition should not be offset by granting an exceptional transboundary pollution license to any developing country or state with special economic or social needs. Rather, the answer to the problem lies in development assistance that allows would-be polluters to carry out necessary projects without causing significant degradation of the transnational environment. This is the clear implication of the policy guidelines set forth in the Stockholm Declaration on the Human Environment\(^{17}\) and as reflected in the Recommendations adopted by the Conference. The essential validity of these guidelines has been repeatedly reaffirmed since, significantly also in the 1982 Nairobi Declaration on the State of the Worldwide Environment. It should be evident, therefore, that while a balancing of interests is by necessity the conceptual basis for any attempt at determining states' rights and obligations with regard to an internationally shared natural resource, this process should not, as a rule, counter-balance the permissibility of
significant transboundary environmental harm. The equitable use principle should be interpreted as automatically indicating an internationally impermissible, because inequitable, resource use by the polluting state whenever significant transboundary environmental harm occurs. This basic entitlement rule should not, however, be considered immutable. Significant transboundary environmental harm ought to give rise only to a presumption of an internationally illegal resource use. However, it should be one which remains open to rebuttal by the polluting state only exceptionally upon demonstration of special circumstances indicating a plausible need for an ad hoc adjustment of the basic allocative rule. Measured against the policy objective discussed before, such an understanding of the basic entitlement rule is clearly superior to the `dual test' version. Compared to another similar conceptualization of the entitlement, namely, the so-called `mitigated-no-substantial-harm' principle, the present approach appears preferable as well. For in contrast to this alternative, it offers a clear and simple point of departure, the illegality of state conduct resulting in significant transboundary harm. Accordingly, it also puts the burden of proof squarely on the polluting state to establish the justifiability of a more intricate balance of rights and obligations.

Two final points need to be made. First, the proposed test does not imply automatic legalization of transboundary effects below the established threshold. Such effects might be appreciable in the sense of affecting the assimilative capacity of the transboundary environment. To this extent they might curtail or even preempt the victim state's use of the natural resource as a pollutant dispersion medium and thereby become an appreciable economic burden to the affected state. In such a case transboundary effects remain subject to a balancing-of-interests to test the international legitimacy of the source state's causal conduct.

The second point concerns the practicability of the proposed threshold test. In the course of the preparatory work for the Institute of International Law's 1979 resolution on `The Pollution of Rivers and Lakes and International Law,' the above conceptualization of the dividing line between permissible and impermissible resource use was rejected on the grounds that it was difficult to see by which objective criteria the threshold harm could be delimited. But this objection is based on a too pessimistic view of internationally accepted or acceptable indicia of what might constitute factually `significant' transboundary harm. Transboundary effects involving, for example, radiological, toxic, or otherwise highly dangerous substances, tend to be counted automatically into that category. Besides, the adoption of bilateral and multilateral environmental standards has expanded the realm of international consensus on what represent environmentally significant transboundary effects. It is not surprising, therefore, that the International Law Commission, in its consideration of the Law of the Non-Navigational Uses of International Watercourses, should have affirmed the utility of a similar factual threshold concept.

3. DEBATE: The Legacy of the Trail Smelter Arbitration

a. A Noteworthy Precedent

The earliest case of transboundary air pollution is the well-known arbitral decision between the United States and Canada resulting from the activities of a Canadian smelter of zinc and lead ores, located in Trail, British Colombia. From the beginning of its operations in 1896, American farmers suffered damage due to emissions of sulphur dioxide by the plant. In 1903, the record year, these emissions exceeded 10,000 tons a month. In 1930, 300 to 350 tons of sulphur, in addition to other chemical residues, poured into the air. Initially, the Smelter company paid indemnities to the pollution victims, either following American court procedures or as a result of bilateral accords. In 1925, the case was reopened after the Smelter added two 409-foot stacks to the plant to increase production, resulting in greater pollution. An association of injured persons was formed in order to obtain general damages in the place of individual recoveries. In 1927, the United States government officially took up the case and presented a claim to the government of Canada. After various efforts to settle the case by other means, the two governments submitted the matter to arbitration, signing a compromise to this effect April 15, 1935.

This compromise settled the issue of responsibility. Its first article obligated the Canadian government to pay the United States government $350,000 to settle damage claims arising out of smelter activity before January 1, 1932. For periods after this date, the arbitral commission was asked to respond to four questions:

(1) Did the Trail Smelter cause damage after January 1, 1932, and if so, what indemnity should be paid as a consequence?
(2) If the first question is answered affirmatively, should the Trail Smelter be required to refrain from causing damage in the State of Washington in the future, and if so, to what extent?
(3) In light of the preceding question, what measures of regime, if any, should be adopted or maintained by the Trail Smelter?
(4) What indemnity or compensation should be paid on account of the decision of the arbitral tribunal?

In an interim decision, dated April 16, 1938, the arbitral tribunal responded to the first question concerning damage caused by the Trail Smelter since January 1, 1932. For the period between that date and October 1, 1937,
the tribunal awarded $78,000 for damage to cleared and uncleared land. The tribunal also decided that the Trail Smelter should be subject to a temporary regime to continue until October 1, 1940, including abstention from causing damage and installation of equipment to control pollution.

The final decision of the arbitral tribunal, issued March 11, 1941, detailed the facts and topographical, meteorological, and economic conditions of the region subjected to pollution. On the merits, it applied the principle of res judicata, calling it "an essential and settled rule of international law" and thus refused to review its previous opinion concerning damage occurring before October 1, 1937. It also refused to allow an indemnity to the United States government for damage to crops, trees or otherwise during the following period, judging that the government had failed to provide sufficient evidence.

As for whether the smelter must refrain from causing damages on the American territory and if yes, to what extent, the Tribunal defined the applicable principles in referring to article IV of the arbitration compromise. It decided that it should take into consideration not only international law and practice but the law and practice existing in federal states. It deemed United States and Swiss law to confer on their constituent units rights analogous to those of states under international law. The arbitrators found the air pollution law of the United States in dealing with the quasi-sovereign rights of the states of the Union, while more definite, conformed to the general rules of international law.

On the international place, the Tribunal asserted a general duty on the part of a state to protect other states from injurious acts by individuals within its jurisdiction. It also noted the difficulty of determining what constitutes an injurious act. In this regard it referred to two decisions of the Federal Court of Switzerland concerning the Cantons of Soleure and Argovia related to a military shooting range which endangered the border between the two cantons. In spite of claims for absolute prohibition of the harmful activity, the Court concluded, and this Tribunal agreed, that precautions taken by a state should be the same as those it would take to protect its own inhabitants.

As for the problem of pollution injury, the arbitral Tribunal found no international precedent concerning the atmosphere or water. On the other hand, some decisions of the United States Supreme Court concerned both sectors and served as a guide. Several are cited, in particular an air pollution decision concerning Georgia and the Tennessee Copper Co. and Ducktown Sulphur, Copper and Iron Co. Ltd. The Tribunal quoted approvingly a judgment of the U.S. Supreme Court for the proposition that a state has an interest in all the earth and air within its domain, and that it is a fair and reasonable demand that the air over its territory should not be polluted on a grand scale by sulfuric acid gas by acts of persons beyond its control. Finally:

The Tribunal, therefore, finds that the above decisions, taken as a whole, constitute an adequate basis for its conclusions, namely, that, under the principles of international law, as well as of the law of the United States, no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.

Thus, for the arbitral Tribunal, Canada's liability for the Trail Smelter derives from its duty to ensure that the Smelter's activities conform to the obligations that international law places on each state. The Trail Smelter itself should refrain from causing damage by emission of fumes on the territory of the state of Washington. The damage which did occur should be fixed by the governments, in conformity with Article XI of the compromise.

The third question posed to the Tribunal concerned the future, asking what measures or what regime should be adopted or maintained by the Trail Smelter. In responding, the Tribunal elaborated a complete system based on studies previously made on its initiative and setting out control measures. The latter included the right to inspect the installations of the Smelter and to visit each property which allegedly suffered damage because of pollution. One detail merits recalling: the regulatory scheme by its own terms established the possibility of modification or suspension conforming to the decisions of a scientific commission to be constituted. The regime thus foreseen was aimed at elimination of future damage caused on the American territory by air pollution. Should the Smelter fail to conform to the order given it to refrain from causing further damage, the Tribunal, in response to the fourth question regarding future damages, approved the principle of indemnity, leaving the extent and amount to agreement between the governments involved.

It is difficult to overestimate the importance of the Trail Smelter arbitration. The compromise itself constitutes a noteworthy precedent, insofar as it announces two principles. First, it recognized the responsibility of a state for acts of pollution having their origin on its territory and causing damage on the territory of other states, even if the polluting acts are not imputable to the state itself or its organs. Thus, the state may be responsible for not enacting necessary legislation, for not enforcing its laws against those within its jurisdiction or control, for not preventing or terminating an illegal activity, or for not punishing the person responsible for it. Second, the compromise transcends international responsibility to solve the problem before it, aiming towards a common regulation of the issue. As for
the tribunal explicitly rejected that part of the claim of the United States based on Canadian violations of United

claimant's territory unless there were actual, provable, substantial, physical damage to a traditional interest. Indeed,

According to the tribunal in the Trail Smelter Arbitration and the commentators following its lead, a state

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has been widely accepted as the foundation of the current general international law of air pollution. One result of

this acceptance has been to bring some certainty into the question of polluting activities. It is a certainty that favors

the polluter in permitting his polluting activities to continue as long as they do not cause ``damage'' in the sense of

direct injury measurable in money terms to the industrial or agricultural production of a second state. This

formulation emphasizing the ``damage'' aspect of the decision deserves closer analysis than it has yet received.

It has often been noted that the tribunal applied a rule of strict liability to the action (or inaction) of the state

permitting emission from its territory to escape; i.e., the United States was not required to prove negligence (much

less design) before Canadian responsibility was engaged. But this apparent tightening of the rule of state

responsibility must be contrasted with the loosening that resulted from replacing the absolute rule forbidding

physical trespass normally applicable in international law with a rule permitting trespasses as long as they do not do

injury for which the 1941 federal law of the United States assessed ``damages.'' In a sense, it might be said that the

general international law of trespass was replaced by the American law of nuisance.

An extremely clear indication is given here of the need to go beyond general international law where

environmental protection generally would be assured only though reparation for damages actually suffered.

b. An Overblown Decision\textsuperscript{19}

Every discussion of the general international law relating to pollution starts, and must end, with a mention of

the Trail Smelter Arbitration between the United States and Canada. For example, in the American Law Institute's

Restatement (second) of the Foreign Relations Law of the United States, the only precedent cited on the topic of a

state's liability to another in connection with pollution is the Trail Smelter Arbitration. Such heavy reliance on a

single precedent breeds overstatement as analysts attempt to reinterpret the case to fit various hypothetical

circumstances and new cases. Frequently, the precedent can be applied only by raising it to a level of abstraction far

beyond the range of its logic. In the Restatement itself, the proposition which the Trail Smelter Arbitration is cited to

support is:

The relation of cause to effect underlies the parallel principle that a state may be held responsible under

international law for damage which it causes in the territory of another state. Thus Canada was held responsible to

the United States under international law for the production of fumes in Canada which polluted the air in the United

States.\textsuperscript{20}

In fact, as will be seen, the arbitration did not hold that polluting the air in the United States was the basis of

the Canadian liability. It is clear that the time has come to re-examine the precedential value of the Trail Smelter

Arbitration, to restore it to its rightful place as a landmark case in a continuum of developing law and remove from

its shoulders the burdens heaped upon it by two generations of publicists.

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injury for which the 1941 federal law of the United States assessed ``damages.'' In a sense, it might be said that the

general international law of trespass was replaced by the American law of nuisance.

It is clear that the rules of international law relating to the permissible actions or inactions of a state affecting

the territory of another state are extremely complex. Some gross extensions of state authority, such as the sending of

military aircraft or troops into foreign territory without the permission of the sovereign whose territorial integrity is

being violated, are likely to be viewed as illegal no matter how ``peaceful'' the intention or how minimal the

``trespass.'' Other extensions of state authority evoke less certain reactions. For example, is it a violation of

international law to support espionage activities in a foreign territory? Or to apply legislation to foreign nationals

abroad whose activities have a general impact on the economy of a state? Or, to phrase the same issue in a novel

way, to permit one's own nationals to act in such a way that their activities affect the general economy of a second

state without the permission of that state?

According to the tribunal in the Trail Smelter Arbitration and the commentators following its lead, a state

would have no hope of successfully presenting a claim with regard to actual physical emissions entering the

claimant's territory unless there were actual, provable, substantial, physical damage to a traditional interest. Indeed,

the tribunal explicitly rejected that part of the claim of the United States based on Canadian violations of United

102
In short, the recent emphasis on ecology and the light thrown on the contribution of pollutants to international boundaries constitutes a violation of international law under the rule of the Trail Smelter Arbitration. The flow of pollutants across international pollution problems, it is the next task to suggest new formulations of the rule in the hope that governments might be persuaded to refrain from inferring a right to pollute from the rule of the Trail Smelter Arbitration.

The job of reinterpreting old precedents and formulating statements of existing general international law begins with the legal community. Having seen the weaknesses of the logic purporting to support the rule of the Trail Smelter Arbitration, and having illustrated the inadequacy of the rule as hitherto construed to cope with current international pollution problems, it is the next task to suggest new formulations of the rule in the hope that governments might be persuaded to refrain from inferring a right to pollute from the rule of the Trail Smelter Arbitration. The technological devices available for limiting pollution in 1941 were much less efficient than those available today. Accordingly, the balance setting the permissible level of pollution above that of outright prohibition had to be tolerated if the benefits of heavy industry were to be retained. It is not clear that this holds true today. If industrial production can be maintained without any pollution of neighboring territory, the rule that permitted the Trail Smelter to continue in operation along with the industries of Detroit and Buffalo would lose its rationale. By the ancient maxim *cessante ratione legis, cessat et ipsa lex* the law of the Trail Smelter Arbitration would lose its validity.

Furthermore, the problems created by the pollution have proved to be so much more serious than originally conceived that it is not certain that anything short of its outright prohibition will serve the needs of mankind. Where there are industrial emissions which do not cause damage is questionable. The interests balanced by the tribunal in 1938 and 1941 were properly confined to the interests of production and commercial agriculture, since there was no threat perceived with regard to the ecology that was in any sense comparable. Today, the threat posed by pollution has been made clearer by scientific advances which have lowered the visible threshold of compensable "damage" brought by industrial production and the agricultural use of polluting chemicals, can hardly hope to be heeded by nations for whom that standard is still a dream that appears unattainable without a polluting byproduct.

A conservation or ecology-minded person would not hesitate to abandon the Trail Smelter precedent when armed with the foregoing analysis. But conflicting forces have arisen since 1941 which complicate the problem. Not only have ecological and environmental values become more important in some parts of the world, but in other parts, unindustrialized states are beginning to develop industrial bases of their own along with new sources of international pollution. Japan and European and North American countries, have developed a standard of living which makes their inhabitants more sensitive to the intangible "damage" wrought by industrial production and the agricultural use of polluting chemicals, can hardly hope to be heeded by nations for whom that standard is still a dream that appears unattainable without a polluting byproduct.

The idea of pollution abatement would be more palatable to developing nations if the protection of the Trail Smelter decision were withdrawn, making it clear as a matter of general international law that polluting a neighbor's territory, befouling the seas, or despoiling the environment of one's own territory so as to endanger the ecology of the planet constituted a violation of an international obligation. This would be the cheapest alternative and, if successful, would stimulate a willingness to negotiate and grapple with the financial implications of any effective attempt to preserve the global environment.

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Furthermore, the problems created by the pollution have proved to be so much more serious than originally conceived that it is not certain that anything short of its outright prohibition will serve the needs of mankind. Where there are industrial emissions which do not cause damage is questionable. The interests balanced by the tribunal in 1938 and 1941 were properly confined to the interests of production and commercial agriculture, since there was no threat perceived with regard to the ecology that was in any sense comparable. Today, the threat posed by pollution has been made clearer by scientific advances which have lowered the visible threshold of compensable "damage" while exposing a substantial threat to the environment and human survival.

Thus there are two fresh applications of the Trail Smelter rule not perceived in 1941: (1) agriculture and animal husbandry suffer much more in the way of compensable "damages" from air pollution than was believed in 1941—consequently, expanded knowledge of the facts will vastly increase the amount of protection afforded by the strict application of the Trail Smelter rule in the future; (2) along with the increased awareness of the extent to which pollution damages agriculture and husbandry, we have also awakened to the fact that pollution presents a grave threat to our general environment. In this sense, the pollution that causes injury "in or to the territory of another [country] or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence," the flow of pollutants across international boundaries constitutes a violation of international law under the rule of the Trail Smelter Arbitration.

In short, the recent emphasis on ecology and the light thrown on the contribution of pollutants to
environmental injury have raised hitherto petty pollutants to a level of "serious magnitude" and have radically increased the class of emissions not permitted by international law. By expanding the definition of the word "damage" to include substantial injury to man's environment, the rule of the case can be preserved in the fullest sense, and modern problems may be handled within the traditional framework.

Still another possibility for reform exists: Redefining by consensus the moment at which the label "pollution" should attach to any activity which alters a natural resource that is left to be used by others. If a legal rule exists requiring abatement or other procedures only after the tag "pollution" is attached to emitted byproducts of human activities, should it remain the rule that the tag not be applied unless some tangible injury is done? Is it enough if there is potential injury; if the alteration of the natural resource is "detrimental" to the resource? Or is a lower threshold appropriate? The narrow rule of The Trail Smelter Arbitration is that there is no legal recourse until the emissions do tangible injury for which monetary damages are traditionally awarded on a showing of monetary loss.

At the opposite extreme, it is possible to argue for the establishment of a rule forbidding any meddling with natural processes until the meddler can prove the absence of significant effect, regardless of whether science can yet determine if the effect is detrimental to any established interest. Convincing policy arguments can obviously be made for such a rule, but it would require a significant change in the view of the law held by most publicists today. A possible middle ground, which satisfies those who are either not convinced of the magnitude of the present threat to the world environment and those who are not convinced of the wisdom of the Trail Smelter rule, would permit emissions to flow across international boundaries as long as they are not "detrimental" to the environment. In short, emissions would not constitute "pollution" absent a showing of "detriment." Disagreements among proponents of these views appear in a disguised form whenever the word "pollution" is sought to be defined and are the chief point of controversy in the current dispute as to what the "rule" ought to be.

4. Standard of Liability

a. The Ambiguity of International Customary Law

The question of the international responsibility of states for extraterritorial environmental damage was one of the principal topics on the agenda of the 1972 United Nations Environment Conference in Stockholm. In Principles 21 and 22 of the Declaration on the Human Environment, reference is made to the question of state responsibility. While Principle 22 merely reflects the obligation of states to co-operate in the further development of international law with regard to liability and compensation for extraterritorial environmental damage in general, Principle 21 expressly stipulates:

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or to areas beyond the limits of national jurisdiction.

A critical element in this formulation of the principle of state responsibility appears to be the fact of jurisdiction or control over the transnational pollution generating activity. Responsibility in this sense—as a corollary of territorial sovereignty on the one hand and sovereign equality of states on the other—had already been affirmed in the Corfu Channel case as the consequence of the well-established principle requiring a state "not to allow knowingly its territory to be used for acts contrary to the rights of others." Moreover, in its advisory opinion in the Namibia case, the International Court of Justice reiterated that physical control of a territory rather than sovereignty or legitimacy of title constituted the basis of a state's liability for acts affecting other states.

It seems thus sufficiently clear that on the basis of these criteria for liability, states are responsible also for activities carried on by private individuals if such activities produce detrimental extraterritorial environmental effects. However, as Principle 22 already appears to indicate, with regard to a basic theory of liability underlying the formulation of Principle 21, no specific inferences may be drawn.

The point of departure in deliberations of the question of the state responsibility is—in accordance with Principle 21—the existence of extraterritorial environmental damage. As a general principle of any developed system of modern tort law, it can be stated that liability attaches only to conduct, that is, acts or omissions, and not to an event per se as the result of such conduct. Existence of "proximate cause," that is, the presence of a legally relevant interrelationship between certain conduct and the occurrence of a certain event, thus presents itself as a minimum condition for incurring liability. Without entering into a detailed discussion of the extremely complex issue of remoteness of damage, the question that can be meaningfully asked in this context is whether Principle 21 can be interpreted as giving expression to such a minimum condition liability regime for extraterritorial environmental effects.

A careful analysis of the history of the drafting of the Stockholm Declaration in general and of Principle 21 in
particular, as well as the comments about it made in both the General Assembly itself and its Second Committee, give rise to serious doubts in this respect. Certainly, General Assembly Resolution 2996 (XXVII) on “International Responsibility of States in regard to the Environment” emphasizes that Principles 21 and 22 of the Stockholm Declaration lay down the basic rules governing this matter. This, however, merely clarifies beyond doubt the customary legal character of claims of states to the use and exploitations of their own natural resources and the equal nature of the principle of state responsibility for extraterritorial environmental damage. What the resolution fails to do is to cast some light on the question regarding the theory of liability itself underlying Principle 21.

By contrast, an examination of the discussions within the Preparatory Committee charged with the task of drafting the text of the declaration, reveals at least clearly the limited relevance of the formulation of Principle 21 as a basis for a presumption of any kind of liability regime for transnational pollution cases.

In view of these remarks, it is obvious that the formulation of Principle 21 can provide little or no support in favor of any specific theory of liability, let alone a form of liability that is dependent on a link of causation in fact as the only prerequisite. This conclusion is further corroborated by an analysis of the subsequent stages in the consideration of Principle 21 at the conference. Thus the principle seems to have been discussed neither by the general Preparatory Committee nor by the plenary conference. The latter, instead, approved the provision on state responsibility, without amendments, by consensus. The reason for this, it is quite apparent, lay in the need for not endangering that basic formula of state responsibility which had been the outcome of a complex balance and compromise between divergent positions of various members of the drafting committee.

(1) International Judicial Decisions

The few international judicial decisions that are germane to the problem of state responsibility for extraterritorial environmental damage constitute only a very narrow basis for the evaluation of the basic theory of the customary legal principle of liability for such damage.

The relevant issue that was before the International Court of Justice in the Corfu Channel case concerned the question of Albanian responsibility under international law for the damage incurred by a British naval unit when it struck a minefield while negotiating a passage through the straits of Corfu which are part of Albanian territorial waters.

The Court considered the question of Albania's knowledge of the existence of the minefield crucial for the answer as to whether Albania was internationally liable. After a thorough investigation, it found that (1) the laying of the minefield could not have been accomplished without the knowledge of the Albanian government; (2) this knowledge had given rise to Albania's international legal obligation to notify international shipping of the existence of the minefield and to warn the British warships; and (3) it was the failure to meet this obligation that had entailed Albania's responsibility under international law. These critical passages of the judgment can in no way be construed to constitute evidence for an incipient reception of a responsibility for risk regime in international law. After all, the Court viewed Albania's responsibility undoubtedly as the consequence of an internationally wrongful "act," namely, of the breach of a duty of notification.

In the much cited, and with regard to its international legal relevance also often overestimated, decision in the Trail Smelter case, an international arbitral tribunal was for the first time confronted with an environmental dispute. Economic damage, in particular to agricultural interests, in the state of Washington owing to air pollution originating in British Columbia constituted the well-known factual background of this decision. In the compromis in which Canada and the United States had agreed to authorize the tribunal to decide on the question of compensation and of a possible regulatory regime for the future operation of the smelter plants at Trail, the fundamental issue of Canadian liability for the damage in the state of Washington had already been anticipated. Additionally, the fact that the compromis required the tribunal to apply both international law and the law of the United States makes it difficult to establish exactly the legal basis on which the tribunal decided the various issues involved in this case. This impossibility of distinguishing between instances in which the tribunal relied on domestic legal precedents and those in which it took recourse to international law obviously is of significance in the evaluation, from an international legal point of view, of the importance of this decision.

In view of these facts it must be sufficiently evident that the Trail Smelter decision can only be considered of limited relevance as an international legal precedent. However, in one passage of the judgment the tribunal pronounced on the question of state responsibility as a fundamental principle of international law:

under the principles of international law . . . no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of a serious consequence.

Yet, the passage, as indeed the whole decision, does not allow any unambiguous inferences with regard to a theory of liability for extraterritorial environmental injuries in general; nor does it support the view of an incipient
While environmental efficiency can be considered a basic tenet of international law, it operates in a system irrespective of national boundaries.

Application of this efficiency approach to border siting policies should allow for the maximization of net benefits from the resource, considering both known and potential environmental costs. Failing to recognize and minimize potential damage costs would result in inefficient resource use, even if the probability of an accident to reach an optimal level of environmental and resource protection. Failure to balance pollution damages against the alternative abatement and regulation costs would indicate a trend towards responsibility for risk as a general category of international liability.

b. Strict Liability and Ultra-Hazardous Activities

This Article examines whether, in the absence of special authorizing circumstances, the conduct of hazardous activities in frontier areas may be impermissible under international law even if the activity (1) is lawful per se and (2) carries a remote—in terms of probability—but obvious risk of serious transnational harm. Alternatively stated, the question addressed is whether imposition of a major risk of transnational environmental harm is permissible under international law where benefits to the risk-exposed state are either non-existent or unacceptable because of the associated risks.

The problem of transnational risk creation should be approached from two international legal perspectives. The first is the doctrine of territorial sovereignty. This doctrine has two aspects with conflicting implications for our inquiry. First, a state is sovereign within its own boundaries, and therefore should be permitted to conduct any activity not per se illegal within its own territory. Second, however, sovereignty also implies freedom from outside interference's and externally caused harm. A decision to conduct a potentially dangerous activity near an international border pits these two characteristics of sovereignty against each other, with the risk-creating state on one side and the risk-exposed state on the other. From this perspective, the question becomes whether the activity carries a transnational risk of such magnitude that it overrides the sovereign claim of the risk-creating state, or, alternatively stated, whether the risk is compatible with the sovereign equality of states and therefore with fundamental principles of international law.

A second principle guiding development of legal norms in this area may be drawn from international environmental law. Specifically, nations have recognized the overwhelming importance of rational management of environmental resources irrespective of national boundaries. International environmental law has generally addressed instances of continuous transnational pollution causing immediate actual damage. The speculative potential damages relating to hazardous border activities may initially appear to negate any useful legal comparisons between ongoing transnational pollution and hazardous facility siting. Yet both involve competing direct and indirect uses of shared air and water resources. To the extent potential extraterritorial damage from facilities may be severe, catastrophic, or irreversible, any distinction between actual and potential consequences of frontier activities that dismisses the legal significance of the latter seems largely unwarranted.

The primary goal in management of internationally shared resources would seem to be maximization of net benefits from the resource or minimization of transnational pollution costs, i.e., pollution control and pollution damage costs. This goal requires balancing pollution damages against the alternative abatement and regulation costs to reach an optimal level of environmental and resource protection. Failure to recognize and minimize potential disasters from hazardous activities would result in inefficient resource use, even if the probability of an accident were relatively low. Applying this efficiency approach, an optional international border siting policy should allow for the maximization of net benefits from the resource, considering both known and potential environmental costs irrespective of national boundaries.

While environmental efficiency can be considered a basic tenet of international law, it operates in a system in...
which narrow national self-interest and notions of "sanctity of national boundaries" and "absolute territorial sovereignty" continue to be frequently encountered obstacles to implementation. This political reality unquestionably shapes the approach toward a systematic resolution of international siting conflicts. However, any final system must promote maximization of values shared by the community at large rather than those which are expressive only of particular national interests. These international political realities compel an essentially inter-state approach to the legal issues associated with transnational risk creation. This viewpoint does not ignore possible alternative approaches to transnational pollution and hazard controversies. Rather it is based on recognition that the concept of territorial sovereignty and the concomitant symbol of international borders play a decisive role in the present inquiry, thus raising basic issues of distributional justice among nation-states.

(1) Transnational Risk Creation and International Law: Past Trends
(a) International Judicial and Arbitral Decisions; The Federal Law Analogy

The relative scarcity of relevant international case law with regard to the present problem is striking. Of the three cases often referred to in an international environmental law context, namely, the Trail Smelter, Lake Lanoux, and Corfu Channel decisions, only the first two are of marginal importance to this discussion.

In the Trail Smelter case, the tribunal was charged with determining, among other things, whether the smelter should be prevented from causing transnational pollution. Once the court decided to forbid smelter activity causing transnational pollution, the court also was required to determine what measures should be adopted or maintained at the plant to assure compliance. In answering these questions the tribunal relied on the fact that the smelter's operation during certain periods of the year resulted in inevitable transfrontier pollution because of the particular meteorological and topographical characteristics of the location. Thus, the smelter operation posed more than a mere potential or remote risk of pollution; rather, the activity actually generated transnationally harmful pollutants. In this crucial aspect, the probability of risk realization, the factual situation underlying the Trail Smelter case is different from the conduct of an abnormally dangerous frontier activity. This observation indicates that the Trail Smelter holding does not apply to risk-creating activities. However, it has been suggested that Trail Smelter essentially applied a reasonableness standard which might be modified to include risk-creating activities "with potentially greater harm calling for abstention from conduct under a proportionately lesser showing that harm will occur." Although such an approach finds support in other evidence discussed below, this interpretation is difficult to reconcile with a careful reading of the decision itself.

A detailed analysis of Trail Smelter must begin with the tribunal's pronouncement that, as a general principle of international law,

[no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another State or the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.

"To illustrate the relativity of the rule" that it is a state's duty to protect other states against injurious acts by its citizens, the tribunal relied on Aargau v. Solothurn. The dispute in Aargau involved two Swiss cantons and the legal question whether one canton was entitled to absolute protection from the trans-border risks emanating from a rifle range in the adjacent canton. There was no allegation of actual damage from stray bullets crossing the boundary between the two cantons. Rather, the defendant sought protection against any risk created by target practice in the border area. The risk-exposed canton argued that the range might conceivably result in injury to its citizens in a manner inconsistent with its territorial sovereignty. The Swiss Federal Court rejected this claim. The context within which the decision is cited by the Trail Smelter tribunal is instructive. The Swiss Court admitted the probability, established by clear and convincing evidence, that continued use of the range could result in stray bullets crossing into the neighboring canton's territory, causing loss of life, physical injury, or damage to property. Nevertheless, for reasons which will later become apparent, the court did not consider it appropriate to prohibit further use of the rifle range. Thus, the extensive citation to the Aargau decision by the Trail Smelter tribunal may be taken to indicate that, for the tribunal, risk creation alone did not merit prohibition of the activity. In other words, mere conduct of a hazardous activity involving a transnational risk might not have been viewed as an injurious act that the risk-creating state would have been obligated to prevent under international law. Admittedly, this conclusion is speculative; and therefore, Trail Smelter's implications for our inquiry are ambiguous.

An analysis of the Lake Lanoux case produces only marginally better insights into the international law of risk-creation. The dispute concerned a diversion of the waters of an international river by France, the upper riparian, opposed by Spain, the downstream state. Although the decision is remarkable for highlighting both the procedural and substantive restraints on a state's use of shared natural resources, it does not deal specifically with the basic issue of this inquiry. The tribunal did address indirectly the question of abnormal risk creation in frontier areas. But in so doing it remained well within the strictures of the compromise and the very narrow treaty-determined context of that
controversy between France and Spain.

Nevertheless, the attention the tribunal paid to the notion of hazardous activities in relation to the principle of good neighborhood is worth noting. In reviewing the legal relevance of Spain's contention that its rights to the waters of the Carol River, as guaranteed by the treaty, would be jeopardized by construction of a power project planned by the upper riparian, France, the court stated, inter alia:

It has not been clearly affirmed that the proposed works would entail an abnormal risk in neighborly relations or in the utilization of the waters. As we have seen above, the technical guarantees for the restitution of the waters are as satisfactory as possible. If, despite the precautions that have been taken, the restitution of the waters were to suffer from an accident, such an accident would be only occasional and, according to the two Parties, would not constitute a violation [of the relevant provision of the governing treaty].

Apart from Spanish water rights under the treaty, the tribunal did not consider the legal implications of a possible Spanish claim that the French water works constituted an abnormally dangerous activity in violation of the principle of good neighborhood. However, the passage above conveys the impression that the tribunal thought that abnormally dangerous activities in border areas constituted a special problem in international relations.

Unfortunately, there was no opportunity or necessity for the tribunal to elaborate on this issue.

The Nuclear Tests cases, on the other hand, presented a clear occasion for an authoritative statement on the international legality of state activities, which, although carried out within national boundaries and not illegal per se, involved an obvious risk of harmful transnational effects. To the disappointment of many, the International Court of Justice (ICJ) failed to seize an opportunity to decide a case which held important implications for international environmental law in general and transnational risk creation in particular.

One of the plaintiffs' objectives was a declaratory judgment regarding the legality of French atmospheric testing. However, over a strong dissent, the Court declined to reach the merits, holding that the controversy had been mooted by the French declaration of intent to discontinue such tests. The Court's indication by the thinnest of possible majorities (8 to 6) of interim measures, provides, of course, no reliable guide to what its decision on the merits might have been. After all, it is the issues of prima facie jurisdiction and threat of irreparable damage to the alleged rights of one of the parties which stand in the foreground of the proceedings concerning interim measures. Comments on the merits of the case in dissenting opinions, therefore, do not necessarily reflect a minority viewpoint. Thus, passages in Judge Ignacio-Pinto's dissenting opinion in the interim measures order may or may not represent the opinion of the court:

I see no existing legal means in the present state of the law which would authorize a State to come before the Court asking it to prohibit another State from carrying out in its own territory such activities [i.e., nuclear testing in the atmosphere] which involve risks to its neighbors.

Later in his opinion, one finds this telling passage:

The point is that if the Court were to adopt the contention of the Australian request it would be near to endorsing a novel conception in international law whereby States would be forbidden to engage in any risk-producing activity within the area of their own territorial sovereignty.

In other words, "the risk of atomic radiation" to which France exposed other nations did not, in his opinion, justify limiting the sovereignty of the testing state. As a logical extension of this view, the operation of nuclear fuel cycle facilities in border areas a fortiori would be permissible under international law because atmospheric testing per se presents a strong basis for a finding of illegality, while, in general, the operation of fuel cycle facilities on national territory undoubtedly is legal. This view of risk-creating activities appears to have been shared by at least one other member of the Court. Inferences with regard to concurring or dissenting opinions of the other judges remain speculative.

On balance, the Nuclear Tests cases simply did not advance the question of availability of prior restraint where the transnational damage is only a possibility. In any case, it is worth emphasizing the fundamental factual difference between testing in the Nuclear Tests cases and operation of nuclear fuel cycle facilities in frontier areas. In the Nuclear Tests cases, one of the main issues was whether actual transnational pollution, without proof of certain or ascertainable material damage, could give rise to a valid international claim for a restraint of the polluting activity. In the case of frontier siting of a nuclear power plant, the basic question is whether, in the absence of an actual transfrontier crossing of pollutants the mere possibility of serious accidental transnational radioactive contamination suffices to render such a siting impermissible under international law.

The implications of these three international law decisions for the issue of transnational risk creation are ambiguous at best. The decisions indicate awareness and concern about the problem, but no clear solutions emerge because the courts never squarely faced the issue. Before turning to an examination of state practice, however, one national court's decision under circumstances analogous to transnational risk creation merits further attention. The
case, already discussed above, is *Aargau v. Solothurn*, which the *Trail Smelter* tribunal considered a relevant precedent in defining territorial relations among sovereign states, even though it involved federal territorial entities. There is little doubt about the significant role national courts play in the articulation and growth of international law. Specifically, the applicability of decisions of domestic courts in disputes between federal states can be defended on the minimal basis that “decisions of national courts can be a source of knowledge of the contents of international law.” At the same time, this argument is subject to the caveat that the “essentially different circumstances of international life from those within a federal system” may affect the findings of domestic courts. In particular, with respect to the relief granted, domestic constitutional provisions are likely to influence a decision which otherwise may be based entirely on international legal principles.

This was indeed the case with *Aargau v. Solothurn*. In the first phase of this conflict, *Solothurn v. Aargau*, the Swiss Federal Court upheld the plaintiff’s sovereignty-based claim to complete protection from the risks associated with target practice in the neighboring canton’s border area, based on applicable principles of international law. In the second phase of the dispute, however, the Court reversed itself and, as noted above, permitted continued operation of the range. The court found that if, in spite of additional safety measures, the extremely small probability of stray bullets could not be eliminated, the continued use of the range entailed a “practically inevitable, in a sense a natural risk,” one that had to be tolerated between neighbors.

Apparently, this reversal was due to federal legislation passed after the first decision. These laws compelled local communities to provide target practice facilities for the military. In view of the unavailability of absolutely safe practice facilities in the community concerned, the Court found that the neighboring canton’s demand for absolute protection against transboundary crossing of bullets was in conflict with implementation of the federal laws. Consequently, in rejecting the claim of the risk-exposed canton, the Court apparently subjected what it originally acknowledged to be the sovereign right of the endangered canton to the requirements of federal law.

It is thus hardly arguable that this latter decision constitutes a valid illustration of the “relativity of the rule” that “a State owes at all times a duty to protect other States against injurious acts by individuals from within its jurisdiction.” Elucidation of the true nature of the second *Aargau* holding enhances the international legal relevance of the first decision and lends support to the argument that the creation of a clear risk of serious transnational damage is unlawful under international law.

(b) State Practice

The difficulty in determining the probative value of a given instance of state practice, often epitomized by the question of whether such instance amounts to a “source” or an element of “evidence” of customary international law, is the result of the nature of the transnational legal order. Apart from the fact that emphasis on the alternative of “source” or “evidence” is hardly the appropriate angle from which to conceptualize state practice, it is, of course, “the belief that [a given] practice is rendered obligatory by the existence of a rule of law requiring it,” that makes the essential difference. But as long as states represent both creators and addressees of transnational legal norms, the line between state practice as evidence of the existence of an international legal custom and as evidence of the process of the formation of such a custom will be difficult to draw. In this situation it is worthwhile to recall the fundamental mechanism of the formation of new customary law as part of the general process of the continuous evolution of international law. Rarely has this process been more succinctly described than in McDougal and Schlei’s discussion of the development of international customary law relating to the uses of the high seas:

[I]t is a continuous process of interaction, of continuous demand and response, in which the decision-makers of individual nation-states unilaterally put forward claims of the most diverse and conflicting character . . . and in which other decision-makers, external to the demanding nation-state and including both national and international officials, weigh and appraise these competing claims in terms of the interests of the world community and the rival claimants, and ultimately accept or reject them.

The requirement of careful contextual analysis of instances of state practice relating to abnormally dangerous frontier activities emerges from this characterization of the process. Basically, two types of situations can be distinguished. First, either the neighboring state objects during or after the initiation of the hazardous activity in the frontier area, or the protest precedes initiation of such activities. Secondly, a state may decide to abstain from conduct of an abnormally dangerous activity in frontier areas in anticipation of diplomatic protests by the neighboring states. In the former type of situation, the response will be more readily ascertainable as being supportive or unsupportive of the claims by the risk-exposed state.

In the latter case, abstention is decidedly more ambiguous from the standpoint of an external observer who tries to determine its legal implications since abstention obviously is also attributable to causes unrelated to any anticipated action by the neighboring state or other members of the international community. Hence, the requirement of a contextual examination applies even more forcefully to this type of situation.
Mere practice of abstention without careful consideration of alternative reasons for it is, as the ICJ and its predecessor have repeatedly explained, insufficient proof of the existence of an international legal custom requiring abstention. To test the legal significance of abstentions from per se lawful activities carrying a clear risk of transnational harm, Kirgis suggests a convincing, if simple formula: ``If freedom of action might plausibly be asserted, and if purely selfish interests would normally be served by action (or by less restraint than is observed), inaction or restrained action is legally significant." These initial clarifications help to provide a sufficiently critical approach to the following examples of state practice.

(i) Hazardous Military or Industrial Activities in Frontier Areas

An early incident of hazardous military border activity, analogous to the conflict in the Aargau litigation, occurred in 1892 when French troops staged target practice exercises near the Swiss border. After Switzerland protested the danger to a nearby Swiss community, French military authorities halted the exercises until steps had been taken to avoid accidental transnational injuries.

In 1948, a munitions factory explosion at Arcisate, Italy, five kilometers from the Italian-Swiss border, caused varying degrees of damage in several Swiss communities. The Swiss government, invoking the principle of good neighborliness, demanded reparation from the Italian government for the damage sustained. The Swiss argued that Italy was liable since Italy tolerated the existence of an explosives factory as well as its attendant hazards in the immediate vicinity of an international border.

Since in any event the international responsibility of the Italian government could have been argued persuasively on the basis of the Trail Smelter and eventually the Corfu Channel decisions, it is of little consequence in this context that despite reiterated Swiss diplomatic efforts the reparation question had not been settled by 1956. The interesting aspect of this incident is that Switzerland chose to base its claim on an allegation according to which the conduct of abnormally dangerous activities in frontier areas was per se violative of international law.

(ii) Supertanker Traffic

A United States-Canadian dispute has developed over use of Canadian waters as a route for supertankers serving a proposed refinery in Eastport, Maine. The only feasible access route includes a treacherous channel between two Canadian islands and hence through Canadian territorial waters.

The Canadian government has argued repeatedly that the potential grounding or collision of a supertanker represents "an unacceptable environmental risk." It apparently believes that in view of the potentially disastrous environmental consequences of a major oil spill, Canada could lawfully prohibit United States-bound supertanker traffic through the channel.

It is both impossible and unnecessary to establish here all the legal ramifications of this controversy. Suffice it to say that Canada's position as the territorial sovereign qua sovereign of the waters surrounding the two islands seems irrelevant in the situation under examination. Indeed, it is suggested that, apart from the narrowness of its permissible exercise, the initial United States right of navigation through Canadian waters resembles the right which a state may have to the conduct of activities in a border zone of its own territory. For it appears that the 1814 Treaty of Ghent might be construed to give the United States a special right of passage that is not susceptible to unilateral suspension by Canada. Thus, the doctrine of innocent passage, which otherwise confers considerable discretion upon the coastal state insofar as restrictions on or suspension of passage through its territorial waters are concerned, appears inapplicable to the present case. In the alternative, the access route to Eastport would be subject to an international straits regime.

In this event, Canada would be authorized to suspend the right of passage of a foreign vessel only if navigation by this vessel through the strait were non-innocent. While a strait state enjoys a measure of discretion in determining the innocent nature of passage, it would appear that a suspension of the right of passage of an oil tanker involving a mere risk of environmental pollution would be subject to a most rigorous test of reasonableness. Recent developments at the Law of Sea Conference confirm this conclusion. In other words, if a Canadian claim to the lawfulness of restricting the United States right of access is subject to well-established legal requirements of proving the reasonableness of this claim, the analogy of the Eastport situation to the previously analyzed cases must be evident. The Canadian government argues from the basis of an "effects" doctrine, according to which an activity whose conduct would normally be a matter of discretion of one state becomes a matter of international concern if the activity affects significantly another state's interests.

This philosophy underlies, of course, claims of risk-exposed states to the "internationalization" of the decision-making process with respect to the siting of abnormally dangerous agencies in the border area of the neighboring state. In a similar vein, Canada adduces the mere creation of a significant risk to its environment as a ground for contesting not only specific characteristics, but the legality of the very conduct of an activity. The fact that the risk creation takes place within the Canadian territorial boundaries is irrelevant because the navigational
channel is not subject to "original" Canadian jurisdiction. The Eastport case therefore constitutes a proper piece of evidence in our inquiry.

(iii) Creation of Transnational Flood Danger

A further instance of state practice relevant to our discussion again involved the United States, this time in a dispute with its southern neighbor. At issue was the construction of a highway in Baja California (Mexico), parallel to the United States border. The manner in which certain northward draining canyons were to be bridged entailed, in the opinion of United States authorities, a potentially serious flood danger to United States territory and its residents. In a letter from the United States Commissioner on the joint International Boundary and Water Commission to his Mexican counterpart, Mexico was exhorted "to take such remedial measures as required to eliminate this threat to the interests of [the United States]." Although the letter referred to the occurrence of damage only as a possibility, apparently contingent on excessive precipitation in the area and failure of the planned earth dams, it nevertheless asserted a Mexican duty to eliminate this risk. The United States Commissioner asserted this duty in terms which went beyond the boundary provisions within the existing United States-Mexico treaty relationship.

In response to the United States letter, Mexico modified its construction plans. Since neither party elaborated on the basis of the alleged duty, the United States letter can be characterized only as a demand for the elimination of a major transnational risk based on some international obligation not derived from a specific bilateral treaty.

(iv) Underground Nuclear Testing

Another risk-creating activity involved the United States in a controversy with some of the Pacific states. Although a 1969 nuclear underground test on Amchitka, one of the Aleutian islands, had drawn strong criticism particularly from the Canadian government, the United States government in 1971 planned an even stronger test on Amchitka, code-named "Cannikin." In response to these plans, the Canadian government "protested" its concern about the proposed nuclear test to the United States government. The reason for making special representations to the United States, and not to the Soviet Union, the Peoples' Republic of China, or France, which at that time were all involved in underground nuclear testing, was, as the Canadian Secretary of State for External Affairs later put it, in the fact that such a test as was proposed could have a direct effect on people living on the Pacific coast in both Canada and the United States. Indeed, such a nuclear explosion [was] to be condemned on two counts: First, it [was] a continuation of the testing and, second, because it happen[ed] to be in an area of difficult terrain where there might be untoward effects.

Specifically, Canada feared that the tests might produce a major earthquake, a tidal wave, or leakage of radioactive materials into the environment, or a combination of these results. The Japanese government shared some of the Canadian fears and expressed its "regrets" over the proposed Cannikin test, together with its concern, inter alia, over the possibility of a tidal wave. Japan, like Canada, reserved its rights to compensation in the event of damage.

In response to the Canadian note, the United States government "assured the Canadian government that the interests of Canada would be taken into full account and careful consideration given to the possible impact of the physical environment on and around Amchitka Island." However, the United States made no further commitment despite extreme pressure, both at home and abroad, that aimed at cancellation of the test.

Given the close security relationship between the United States and the objecting countries, and the well-established fact that both Canada and Japan benefit from United States strategic forces and the retention of a credible retaliatory capability which Cannikin was designed to preserve, neither Canada nor Japan was in a position to argue forcefully against the United States test. In addition, it is probably true that in view of the otherwise extremely good relations among the countries concerned, it would have been bad diplomacy for either country to press a claim which, given the interests involved, was likely to be rejected by the United States. However, had the nations enjoyed less favorable relations, and had the national security aspect been missing, the protests might well have included an allegation of the per se illegality of the test based on the transnational risks involved.

(v) Hazardous Border Installations

An interesting comparison to Cannikin is provided by a case in which national security was at least implicitly claimed to be at stake and to constitute the reason for the preservation by a state of transnationally hazardous conditions in border areas. However, in obvious disregard of the motives underlying the claim by the risk-creating state to the lawfulness of its conduct, this assertion of sovereignty was rejected by the risk-exposed state as impermissible under international law.

In 1949, Austria protested formally the existence of mine fields in Hungarian territory close to the border with
indefinite shelving of the project is seemingly devoid of any internationally relevant precedential effect. The
This case is thus undoubtedly instructive, even though the apparently elegant settlement of the dispute through
reasons for the decision more complex, than the public statement would indicate. Indeed, Austrian opposition to the
Evidence has recently appeared, however, which suggests that the scope of the Swiss decision was broader, and the
The significance of this state practice example is that the Austrian protests at all times focused on the
elimination of the risk of transnational damage. The protests were not based on Hungary's legal obligation to refrain
from causing extraterritorial damage. Rather, the notes emphasized the element of risk, characterizing the creation of
a danger of severe transnational harm as impermissible under international law. Subsequently, Hungary did remove
or relocate all minefields away from the frontier.

(vi) Weather Modification Activities
Another area of interest for this inquiry is planned weather modification. On a national level, weather control
experiments and operational programs have been occurring for some time. While the problem of transnational
effects of nonhostile weather modification activities is not new, state practice in this field has remained fairly
limited.

(vii) Nuclear Plant Siting
Finally, to complete the overview of international disputes concerning border area activities that carry a risk of
transnational harm, we shall consider nuclear power plant siting in border areas.

Not surprisingly, the location of nuclear power plants in areas close to international borders has repeatedly
been the subject of international diplomatic activity. Dukovany and Ruthi are two proposed nuclear power plant sites
that have given rise to transnational concern in Central Europe. Another nuclear power plant site near Greifwald
(East Germany), apparently at issue between Scandinavian countries and the German Democratic Republic, was the
object of an inquiry with the Commission of the European Communities. In many other situations the transnational
concern simply did not reach the same explicit official level.

A highly interesting dispute in which the international legal implications of the siting decision apparently were
raised in a pertinent way, involved Switzerland and Austria. Swiss plans to construct a 900 MW(e) nuclear power
plant near Ruthi in the Upper Rhine Valley close to the Austrian border caused serious concern in the neighboring
Austrian state of Vorarlberg over the project's transnational environmental implications. Although the Austrian
concern may have been partially aesthetic, the safety aspect played an equally significant role in Vorarlberg
opposition to the Swiss project.

These objections were brought to the attention of the Swiss authorities, who entered into consultations with the
Austrian federal government and the Vorarlberg state government. The talks centered on the international legal
principle of good neighborhood as applied to the projected nuclear power plant near Ruthi. The Swiss authorities
re-evaluated the entire project as a result of the international controversy aroused. Shortly before the study was
completed, the Austrian foreign minister stated that, should the Vorarlberg government still believe the final Swiss
decision was in conflict with the principle of good neighborhood and hence violative of international law, the
Austrian government was committed to assert formally the illegality of the project to the Swiss government. This
position, the minister asserted, had been explicitly communicated to the Swiss government.

In the fall of 1975, the Swiss Minister of Transportation and Energy, speaking before a private forum, revealed
that the Ruthi project had been shelved temporarily. This statement in itself does not indicate the legal position taken
by Switzerland vis-a-vis the prospects of an official Austrian note charging a violation of international law. The
Swiss authorities' "mothballing" of the Ruthi project could be interpreted as the consequence of adjusting planned
energy production capacity to forecasts of a significant reduction in the growth of domestic electricity consumption.
Evidence has recently appeared, however, which suggests that the scope of the Swiss decision was broader, and the
reasons for the decision more complex, than the public statement would indicate. Indeed, Austrian opposition to the
proposed nuclear power station aired within the consultative framework of the Lake Constance Convention must be
considered a crucial factor. It now appears that the Ruthi project has in fact been canceled, and that this decision
came at least in part as a response to Austria's opposition.

This case is thus undoubtedly instructive, even though the apparently elegant settlement of the dispute through
indefinite shelving of the project is seemingly devoid of any internationally relevant precedential effect. The
existence of an international controversy engulfing the projected site for a nuclear power plant in the vicinity of an international border remains a fact, as does Swiss inaction on the implementation of the project.

(2) Parameters for an Evaluation of the Permissibility of the Conduct of Abnormally Dangerous Activities in Frontier Areas

In view of the virtual absence of bilateral or multilateral international treaties bearing directly on transnational risk creation, the preceding case studies gain special relevance as evidence of state practice. Because they reveal a consistent pattern of responses to the initial claims by states to the conduct of transnationally hazardous frontier activities, these cases are even more significant.

The following discussion examines the nature of these reactions and develops a framework for evaluating the permissibility of a hazardous frontier activity. The objections of risk-exposed states generally take the form of diplomatic protests against the hazardous nature of the activity and its proximity to the territory of the complaining state. The complaining states seek either the elimination of a recognizable risk of transnational harm or compensation for damages sustained from the realization of such a risk. In both situations, the risk-exposed state implies that, since the hazardous conduct is incompatible with the principle of good neighborliness, it is impermissible under international law.

The permissibility of a hazardous frontier activity is viewed to depend upon the resulting degree of risk of transnational harm. Risk-exposed states characteristically claim major risks, such as "an unacceptable threat to the environment" and "a danger to the lives, the health and property of citizens" of the threatened state. Such expressions of perceived major risk constitute an essential element of the argument that the challenged activity is impermissible. Since there must be "substantial," "significant," or a similarly qualified degree of extraterritorial damage before a state is liable for pollution damages, international law will probably protect against a transnational risk only if that risk exceeds an analogous threshold. If such a threshold is required, the permissibility of a hazardous frontier activity depends upon the magnitude of risk.

Because of the legal insignificance of minor damages, the state practice examples emphasize the potentially serious consequences of a major accident rather than the high probability that a lesser accident may occur. Similarly, in those examples in which international claims were put forward ex post facto, the foreseeability of the severity of the damage, rather than the high probability that the damage would occur, was used to support such claims. These cases therefore suggest strongly that the greater the harm threatened, the smaller the probability of its occurrence needed to create a duty to prevent the infliction of transnational harm by abstaining from risk-creating frontier activity.

Risk is a product of magnitude, the amount of damage resulting from a given event, and probability, the likelihood that the event will occur.\textsuperscript{32} Evaluation of risks associated with hazardous frontier activities thus requires separate consideration of the magnitude and probability components.\textsuperscript{33} Assuming a constant level of "significant risk," we can conclude that the greater the harm threatened, the smaller need be the component element of probability to attain a constant notion of legally significant risk. The international legal significance of the function operated in this way finds support in writings and evidence discussed below, beyond the present survey of state practice. The function does not, however, work both ways. There exists a threshold below which extraterritorial effects of a state's activity are insignificant from an international legal viewpoint no matter how large the probability of their occurrence.\textsuperscript{34}

This approach to transnational risk creation has already been encountered above. In reviewing the strict standard of proof of actual transnational damage (including also probable, as against merely possible, damage) under the Trail Smelter formula, Kirgis asks "whether a disinterested decision-maker thirty years after Trail Smelter, in a world awakened to the existence of environmental deterioration, would find the clear and convincing standard literally applicable when there are plausible consequences magnified far beyond those considered in that case."

Other writers have also supported a modified standard of proof approach, apparently as a result of a greater environmental consciousness and increased attention towards environmental preservation. They appear to agree that, even though this approach is not directly derived from the Trail Smelter decision, the approach is not inconsistent with it. However, opinions differ over the legal relevance of this method of establishing a duty of abstention. Kirgis intimates that a modified standard is part and parcel of community expectations for the international decision-making process relating to transnationally hazardous activities. Kiss, on the other hand, denies the present existence of an ascertainable international duty of prevention based on the modified approach. However, he recognizes the need for the law to develop towards this end. Wildhaber recently commented on Kirgis's standard of proof arguments, admitting that "[g]iven the present state of international and national law and the threat to the environment, the existence of a duty of prevention cannot in fact be denied." The strongest support for the modified approach to transnationally hazardous activities comes from Randelzhofer and Simma. They paraphrase Kirgis'
modified standard-of-proof approach, restating it as the unequivocal international legal principle for determining the legal relationship between risk-creating and risk-exposed states.

The same approach was implied in some of the Australian arguments in the Nuclear Tests cases. It also emerged indirectly from discussions on weather modification activities held during the 1974 American Society of International Law Conference on the avoidance and adjustment of environmental disputes. Compliance with the duty to obtain prior consent by the risk-exposed state or states was considered crucial to the lawfulness of a proposed activity. Such a duty was found to arise in the cases of large-scale experiments and of the mitigation of severe storms over ocean areas. By contrast, small-scale activities were not considered to entail such an obligation. Support for a standard of proof proportional to the potential harm can also be found in United States domestic litigation.\textsuperscript{35}

The reasonableness and present applicability of a duty to prevent damage to a neighboring state by abstaining from conduct creating transnational environmental hazards can be inferred from the international obligation of states not to permit or cause harm to the environment of other states. The rejection of the idea that, as a general principle of international law, states might be entitled to buy transnational pollution easements by way of compensation for the extraterritorial environmental damage inflicted, entails a corollary, the duty to abstain from conduct that would or most likely would result in such damage. In controversies where there is not virtually assured transnational injury, but there is some potential for extremely severe transnational environmental consequences, further analysis requires reconsideration of the fundamental purpose of the international proscription of activities causing significant transnational pollution damage.

On both a national and an international level, the basic philosophy underlying environmental regulation is to preserve the environment in a wholesome state and safeguard it against disastrous and irreversible degradation. International environmental concern, at least in the last resort, aims at the prevention of transnational inflictions of such degradations. Hence, potentially catastrophic consequences dwarf the legal relevance of a low probability of such consequences and may alone warrant prevention of the hazardous activity.

After a disastrous accident, restoration of the affected transnational environment may prove either impossible or achievable only over a long period of time and may entail great social and economic hardship. Whatever financial payments might be made as compensation for the extraterritorial damage caused, they are more likely than not to represent mere token amends for the ecological damage inflicted.

From an international legal point of view, it is thus not difficult to see why assertion by a state of a sovereign right to conduct an activity may be unacceptable if the activity, though neither unlawful per se nor "more likely than not"\textsuperscript{36} to cause significant extraterritorial damage, carries a risk of catastrophic transnational effects. Such an assertion is expressive of an extreme form of national self-interest tantamount to a potential denial of other states' territorial sovereignty.\textsuperscript{37} It constitutes pursuit of a policy with implications incompatible with the basic structure of today's international society: it violates what remains an avowed cornerstone of the international legal system, the sovereign equality of, and the independence among, states. Therefore, barring a special relationship between risk-creating and risk-exposed states, such as reciprocity of risk creation or a sharing in the benefits to be derived from the proposed activity, such an activity should be considered impermissible.

In practice, few cases will ever arise where the proposed activity will create an undisputed risk of transnational catastrophe. Danger often lies in the eye of the beholder, particularly in an era in which accelerating scientific and technological developments outpace society's ability to understand and evaluate the social and environmental implications of such developments. The assessment of the effects of technological change is a complex and demanding endeavor, which frequently produces controversial findings.\textsuperscript{38} As a result, where new technologies are involved in a frontier activity, evidence concerning the probabilities and potential consequences of accidents is likely to be quite ambiguous. Hence, the modified standard of proof approach alone may prove a largely ineffective tool for establishing the permissible of a proposed controversial frontier activity.

Given the inherent uncertainty surrounding transnational risk, determination of the permissibility of the hazardous frontier activity requires recourse to other criteria of "reasonableness," suggesting a balancing of interests approach. A balancing test follows from the fundamental nature of the dispute, a clash of correlative and interdependent claims grounded on the notion of territorial sovereignty, which implies exclusive jurisdiction and control over national territory.\textsuperscript{39} This evaluation of the conflicting claims, including those explicitly formulated by the directly involved parties, as well as the ones which must be deemed implicitly asserted in the social and environmental context of the international community at large, appears overwhelmingly sanctioned by international legal practice. It is also almost uniformly advocated by international lawyers.

Hence, although a potential for catastrophic transnational environmental impact would theoretically outweigh other considerations and render the hazardous activity an unreasonable assertion of sovereignty, in practice the
reasonableness of a given activity may have to be ascertained on the basis of a multiple factor analysis. This analysis would include consideration of the probability and the magnitude of the harm threatened. In addition, it would form the framework for determining the ultrahazardous nature of an activity for the purpose of reallocating the social costs associated with the activity.\textsuperscript{40}

For purposes of the present discussion, reference to the exemplary listing of relevant criteria in the Restatement of Torts is both instructive and valid from an international legal point of view. Such criteria constitute parameters in any balancing process involving a hazardous activity whether in a national or transnational legal context. These criteria include: (1) the probability of harm; (2) the magnitude of the harm threatened; (3) the interrelationship of risk elimination and exercise of reasonable care; (4) common usage; (5) locality; and (6) the value to the community.\textsuperscript{42} Other criteria of reasonableness, such as those listed in the so-called Helsinki rules, serve at least a supplementary function where appropriate.

Applied to the present inquiry, “common usage” might be exemplified by reciprocal risk creation along a common border. Such reciprocity could constitute an effective bar to an allegation by one state that the hazardous frontier activity of a neighboring state is unlawful \textit{per se}.\textsuperscript{43} A finding of “common usage” would immediately terminate the inquiry.

The “value to the community” factor is also of little interest here, for it refers to the relationship between risk-creating and risk-exposed states. Yet, no direct benefits are assumed to accrue to the risk-exposed state and indirect benefits are assumed to be rejected as being unsolicited and outweighed by the associated risks.

Similar considerations apply to factor (3), “reasonable care and risk elimination.” Its relevance is limited because it is assumed that the manner in which the activity is conducted is reasonable in the sense that all relevant physical features of the frontier site, \textit{e.g.}, the topography, ecology, seismology, hydrology, population density, etc.) have been taken into account in the siting, design, construction, and operation of the plant. In other words, as “the relation of the activity to its surroundings is the controlling factor,”\textsuperscript{44} a frontier activity is reasonable only to the extent that its modalities reflect the findings of transnational safety analyses that consider the possible transnational environmental consequences of national action.\textsuperscript{45} Factor (3) thus does not refer to the political feature, as it were, of the site, its location near an international boundary, and that factor’s implication for the reasonableness of the conduct of the hazardous activity concerned.

Since the risk of transnational harm associated with a given hazardous activity is a function of the “locality” factor, that factor itself becomes the crucial element in the determination of the reasonableness of the conduct of the activity concerned. Identification of a frontier location as a major contributor to a significant transnational risk in terms of catastrophic consequences should demonstrate that the conduct of the activity in that location is contrary to principles of international law. However, availability of alternative sites and cost effectiveness of upgrading safety systems at the frontier location may nevertheless need to be considered in determining the reasonableness of the siting decision.

(3) Conclusion and Outlook

Although the few pertinent international arbitral and judicial decisions do not provide a basis for unambiguous inferences, state practice, analogous national legal decisions, and international legal literature represent fairly consistent pieces of evidence pointing to the following conclusions:

(1) Assuming that no special authorizing circumstances prevail, conduct of an activity in frontier areas is incompatible with established principles of international law if: (a) the activity concerned involves a major risk of transnational harm; (b) this risk is a function, at least to a significant degree, of the location in which the activity takes place; and (c) the activity in that frontier location amounts to an inefficient use between the risk-creating and risk-exposed states of the internationally shared natural resources concerned, provided the risk is not already of such an obvious nature or magnitude as to render the activity incompatible \textit{per se} with fundamental principles of the sovereign equality and independence of states.

(2) The parameters of “major risk” are determined through the use of a modified standard of proof: if “risk” is defined as the probability of occurrence of a harmful event multiplied by the consequences of the event, the required showing of probability is inversely proportional to the showing of potentially harmful consequences. In other words, the greater the harm threatened, the smaller is the required probability of occurrence in order to make transnational risk creation a matter of lawful international concern.

(3) For the purpose of assessing the legal relationship between risk-creating and risk-exposed states, any distinction between actual and potential transnational harm that limits the operation of international law to the former, is accordingly unwarranted, where the hazardous activity concerned involves a risk of transnational harm which is severe in the sense of posing a substantial threat to the lives and health of persons or of large-scale or long-
term transnational environmental degradation.

The finding under the above principle of inverse proportionality that the conduct of an activity may be unlawful even though the transnational harm has a very low probability is of major importance. It highlights the relativity of a state's right to engage in hazardous activities in its border areas. The relative nature of a right to risk creation along national borders may further be subject to a review concerning its compatibility with the overriding principle of the maximization of the aggregate benefit to be derived from the use of the internationally shared natural resource. Since risk assessment is essential to the determination of the lawfulness of the activity, states are under an international duty to submit any on-going or planned hazardous activity in their border areas to review by the risk-exposed states if the risk involved is recognizably major in terms of the threatened transnational consequences even if the realization of those consequences is only a remote possibility.

This requirement seems a fundamental tenet of present-day international environmental law. Specific instances of international practice are sufficiently numerous and consistent to confirm the existence of a general duty of information and consultation on the part of states whose planned activities are likely to entail transnationally harmful effects, a duty inferable from the principle of good neighborliness. As such, it extends comfortably to planned activities which carry a risk of merely remote probability, provided the consequences associated therewith are major or their nature or extent is at least a matter of controversy between risk-creating and risk-exposed states.

Risk-exposed states are, however, entitled to more than mere receipt of information and a hearing in the bilateral forum of interstate consultations. Given the interdependence among states, the principles of good neighborliness and international solidarity require certain substantive limitations on states' rights to transnational risk creation. Generally, this does not imply a right to veto a hazardous activity in the border area. Rather, these principles suggest that, given the nature of the threat, namely its uncertainty coupled with predictably severe consequences in case of its occurrence, the exposed state should be entitled to an equitable solution. Indeed, in the absence of an authoritative third-party determination and balancing of the interests at stake, mutually acceptable agreements regarding the conduct of risk-creating activities at issue among the potentially affected states should be the end product of existing procedures for resolving or anticipating conflicts over the use of internationally shared natural resources.

The difficulties that may be expected to arise in the substantive solution of conflicts have already been discussed elsewhere.

To the extent that the complex task of overall risk assessment and the contextual evaluation of the claims which bear on the risk-creating activity require third-party intervention, the problems inherent in the application of the proffered solution are obvious. States are notoriously reluctant to submit to external fora disputes over direct utilizations of transnational natural resources, such as international watercourses, which entail actual transnational effects. This must a fortiori be true for indirect utilizations which pose only a remote danger.

Be that as it may, by clarifying the fundamental legal relationship between risk-creating and risk-exposed states, the findings of this Article cast light on the respective initial bargaining positions in bilateral negotiations, the most likely forum for the settlement of a conflict over the conduct of an abnormally dangerous activity in frontier areas.

By indicating the availability of alternative strategies for a dispute settlement, including avoidance of the frontier site, or in situ reductions of the risk potential, the above approach to the question of legality should allow an accommodation of conflicting interests which ought to be satisfactory to both sides.

Finally, the management endeavors with respect to the international environment should evolve toward anticipation of international conflicts over resource utilization at the earliest possible stage. If national land use plans, particularly with regard to border areas, are internationalized only after they have been drafted and accepted by the risk-creating state, a fait accompli is forced upon the notified neighboring and affected states. Joint regional planning commissions are necessary to develop blueprints for long-term management, before national plans become firm. Fortunately, development in this direction is encouraging. Such a policy makes economic sense as it reduces costs to the parties when a possible dispute is resolved by joint planning ab initio rather than by cancellation or redesign of mature national projects. Joint planning, moreover, would tend to yield substantial environmental benefits through early and more thorough identification and elimination of potential hazards to the internationally shared environment.

c. Special Consideration for Developing States

Before examining the doctrinal and practical bases for providing special consideration to developing states for damage caused by lawful activities of such states and the treatment accorded by the Schematic Outline of the International Law Commission, it is useful to describe an example of current international behavior that illustrates
some of the implications and complexities of the issues to be discussed. The 'Grey Triangle' is a set of three copper
smelters located approximately fifty-five miles apart along the Mexico-United States border—two in the Mexican
state of Sonora and one in Arizona. Of special concern are the smelter scheduled to begin production in early 1986
in Nacoziari, Mexico (the 'Nacoziari Smelter') and the smelter located immediately adjacent to the border in Douglas,
Arizona (the 'Douglas Smelter'), which has operated since 1913. The term 'Grey Triangle' refers to the smelters' emission into the atmosphere of massive quantities of sulphur dioxide, which causes transboundary acid deposition in northwestern Mexico and the western United States.

The Douglas Smelter is allowed—until 1988—to operate without pollution controls but must comply with the
ambient air quality standards of the Clean Air Act within the United States. Apparently as a result of the
inapplicability of those standards in Mexico and the absence of any equivalent Mexican standards, the Douglas
Smelter reportedly releases much of its pollutants at night when the wind blows toward Mexico.

The Nacoziari Smelter is owned by a Mexican joint venture, which is owned 44% by the Mexican government
and 56% by private interests. At least some of the private portion is indirectly owned by a United States corporation.
The smelter was financed in part by a loan from the Japanese Export-Import Bank, a Japanese government
institution. In addition, a Japanese company was hired in 1983 to provide engineering services and to supervise the
construction of the plant, as a replacement for a United States firm that had initially managed the project. The
smelter will emit even more sulfur dioxide than does the Douglas Smelter—approximately 1260 tons per day—a large
volume of which is expected to migrate to the United States. Estimates of the amount of such pollution vary, but it is
clear that the smelter will significantly increase the amount of sulfur dioxide pollution and the amount of acid
deposition in the western mountain region of the United States, thereby causing considerable harm to that region.

A 1983 executive agreement between Mexico and the United States (the 'La Paz Agreement') provides a
framework for negotiations to establish air-pollution regulatory standards in the 100 kilometers (approximately 62.5
miles) on either side of the border. Negotiations under the La Paz Agreement resulted in an agreement, dated July
19, 1985, to control emissions from the smelters, including: (1) the Nacoziari Smelter is to install pollution controls
by January 1988; and (2) the Douglas Smelter is to comply with the Clean Air Act by January 2, 1988. It is not clear
that the July 19, 1985, agreement will be effectively implemented, inter alia, because the agreement appears not to
be legally binding, because Mexico's environmental law lacks the enforceability of the United States Clean Air Act,
and because Mexico, as a developing state, has possibly overriding priorities for developing the border area.

(1) The Doctrinal and Practical Bases for Providing Special Consideration to Developing States.

The doctrinal basis for providing special consideration to developing states, and indeed a basis of the
schematic outline's balance-of-interests test more generally, may be found in Principle 23 of the Stockholm
Declaration of the United Nations Conference on the Human Environment:

Without prejudice to such criteria as may be agreed upon by the international community, or to standards
which will have to be determined nationally, it will be essential in all cases to consider the systems of values
prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced
countries but which may be inappropriate and of unwarranted social cost for the developing countries.

It has also been suggested that reducing damages because of the poverty of the tortfeasor may be a general
principle of law, within the meaning of article 38(1)(c) of the Statute of the International Court of Justice. Such a
general principle would obviously support providing special consideration to developing states. In addition, and
more broadly, special consideration for developing states is consistent with, and derives support (at least in a policy
sense) from, the movement for the New Economic Order, which has affected many developments in international
law over the past two decades.

On a practical level, an International Law Commission Committee raised the following difficulties that
particularly affect developing states: (1) a developing state may not have sufficient information to predict the
potential for transboundary harm created by activities within its territory of foreign or foreign-owned entities
because the developing state may not receive full information from these entities; (2) a developing state may not
have sufficient technical expertise to evaluate complex technological proposals or to monitor ongoing performance,
especially where control of the day-to-day operations is effectively foreign; (3) a developing state may lack
regulatory and administrative skills necessary to effectuate pollution control laws; (4) a developing state's pollution-
control laws may inadvertently be inadequate (e.g., because of less expertise); and (5) the need to develop may
force, or at a minimum prompt, a developing state to accept foreign (or domestic) investment that carries with it a
high risk of transboundary harm. Each of those five possibilities, for example, might influence industrial-siting
decisions of heavily polluting industries (such as chemicals or paper) toward locating in a particular state.

On one level, the problems identified in the immediately preceding paragraph can be viewed as relating to
developing states as potential source states: those disabilities would make it more likely that activities giving rise to
transboundary harm would occur within the territory or control of a developing state. Some of those problems might also be viewed as relating to developing states as affected states if the home state of a foreign investor is required to share liability or is held solely liable for harm caused to a developing state by activities of the foreign investor or its subsidiary within that developing state. That situation might be present in the case of the Nacozari Smelter: it might be argued that Japan, on account of its governmental loan assistance or the participation of the private Japanese construction company, and the United States, because of the involvement of a private United States indirect investor, should share liability with Mexico for pollution damage in the United States, or should be jointly liable for pollution damage in Mexico.

A problem that was mentioned as potentially relating to developing states solely in their capacity as affected states was their unusually high risk of suffering transboundary harm from ill-planned or hazardous activities of their neighbors. This risk exists partly because the neighboring states are typically developing states themselves, and partly because the governments and people of the affected developing states are not as aware of potential harm or as able to detect, monitor, or remedy such harm. One example provided in the Sixth Committee concerned the transnational `trade in chemicals, pharmaceuticals and similar products of dangerous nature, the use of which was banned in the state where they were manufactured'; another example was the `export' of dangerous industries from developed to developing countries. Neither of those examples would result in international liability under the schematic outline, because the requisite `physical linkage' is absent. As is discussed below, that result seems proper. In the context of the Grey Triangle, however, the asserted disabilities most probably would harm Mexico as an affected state vis-a-vis the United States. It is at least arguable that Mexico and Mexicans are less attuned to the dangers of sulfur dioxide pollution in the case of copper smelters such as the Douglas and Nacozari Smelters than are the United States and the United States populace, though one suspects that Mexico was quite aware of the problem. It is much more plausible that Mexico is less able to monitor and remedy the harm than is the United States.

(2) The Schematic Outline's Treatment of Developing States.

The schematic outline developed by the International Law Commission for the international liability of states for damage resulting from lawful activities does not expressly provide preferential treatment for developing states, and none of the "principles," "factors," and "matters" enumerated in the schematic outline apply, by their terms, only to developing states. Nevertheless, several of those criteria may have the effect of giving (and may have been intended to give) special consideration to concerns of developing states.

The factors listed in section 6 of the schematic outline include: the importance of the activity to the source state; the physical and technical capacities of the source state, e.g., in relation to its ability to take preventative measures, make reparation, or undertake alternative activities; and the extent to which assistance is available to the source state from third states or international organizations. In addition, section 7 provides as a matter possibly relevant to the question of compensation: `A decision as to where primary and residual liability should lie, and whether the liability of some actors should be channeled through others.' That matter may have been intended as a means of allocating liability to a developed state in which a transnational corporation is incorporated, where a branch or subsidiary of that corporation is located in a developing state and causes harm to a third state or to the developing state itself. A factor in section 6, `[t]he extent to which the affected State shares in the benefits of the activity,' may have a similar effect if the parent corporation is located in the affected state. The principles in section 5 support the factors and matter just described. Moreover, section 5 allows `liberal recourse' to inferences of fact and circumstantial evidence if `an acting State has not made available to an affected State information that is more accessible to the acting State,' which may have been intended, in part, to deal with the possibility that developing states may not have access to the information necessary to plan or regulate adequately.

The asserted disabilities of developing states (described above) have potentially profound implications for the effect of the international-liability rules to be developed by the Commission. Assuming that many or all of the empirical assertions regarding the developing states' disabilities and other difficulties are accurate, the question remains whether the approach adopted in the schematic outline is desirable. Applying the principles, factors, and matters enumerated in the schematic outline to the Nacozari Smelter illustrates some of the issues involved. For example, how should the `importance' of the Nacozari Smelter to Mexico, a factor from section 6, be measured--should importance be measured in terms of gross national product (GNP), export earnings, employment potential, political stability, or some combination of these and other elements? If the measurement should be in terms of GNP, would it be reasonable to require less reparation from Mexico for harm to the United States from the Nacozari Smelter than the United States would be required to make for harm to Mexico from the Douglas Smelter, solely because the Nacozari Smelter (presumably) represents a greater percentage of Mexico's GNP than the Douglas Smelter represents of the United States' GNP? Additionally, if Mexico's lower technical capability to take
preventative measures results in less required reparation--a result that is supported by the idea that a state should not be accountable for something it cannot prevent--would not there be an incentive to Mexico to refrain from improving its technical capabilities? Also, is it possible to formulate nonarbitrary standards capable of principled application with respect to differences in technical capabilities? Further, assuming that the term `assistance,' in the factor allowing assistance to a source state to be taken into account, includes monetary assistance, should the loan from Japan to Mexico to finance the Nacozari Smelter affect reparation determinations, or will that serve as a disincentive to potential donors generally or to Japan in this specific instance?  

Another question of particular importance is whether the determination of reparation should be affected by the wealth of the source state. Should there be a lower standard of reparation for the Nacozari Smelter than for Canada's Trail Smelter (which was the smelter involved in the case) that most specifically supports international liability) or for the Douglas Smelter, simply on the ground of the economic disparities between Mexico, Canada, and the United States? The most recent multilateral convention relevant to that question is the 1982 Convention on the Law of the Sea. That convention provides numerous preferences to developing states, but none of those preferences decreases the standard of care due by a developing state with respect to the environment. Of particular interest are articles 202 and 203, dealing with 'Protection and Preservation of the Marine Environment,' which provide preferences to developing states with respect to financial and technical assistance but leave intact such states' duty to protect and preserve the environment. Such an approach is supported by the facts that global pollution has reached serious proportions, that developing states' activities have the potential to worsen significantly that condition, and that it would be extremely difficult, if not impossible, to correlate wealth-levels with standards of care in any nonarbitrary manner. The approach adopted by the Law of the Sea Conference thus embodies the view that the appropriate way to aid developing states is to help them meet their duties of care rather than to decrease those duties.

Developing states have counter-argued in the context of pollution outside the realm of the Law of the Sea Convention, however, that, regardless of how serious pollution problems currently are, the developed states created those problems by their past industrial activity and the developed states alone thus should bear the financial costs of remedying the situation or of not worsening it, at least until developing states have had an equal opportunity to pollute. That logic would lead to the conclusion that developing countries should be allowed to pollute in order to modernize, at least to the same extent that the developed states have in the past. Furthermore, it has been argued that the developed countries are the true source of environmental damage--even that occurring initially in developing countries--because developed countries consume many more resources on both an absolute and a per capita basis, or that environmental damage is the fault of the rich, wherever they are. Finally, it may be argued, a solution of the type in the Law of the Sea Convention is unrealistic and unworkable because the amount of aid required by that approach will almost certainly not be forthcoming.

The last-mentioned argument is supported generally by the inadequacy of the financial and technical aid that has been available to developing states over the past four decades. Specific support is provided by the aftermath of the 1972 United Nations Conference on the Human Environment. Developing states reportedly participated in that conference on the understanding that their interests would be taken into account, and the Action Plan for the Human Environment adopted at the conclusion of the conference recommended that additional development assistance be available to meet the developing states' increased environmental requirements, to compensate for significant dislocations in developing states' exports, and to subsidize research in developing states' environmental problems. Nevertheless, the amount of development assistance in the environmental area over the past fourteen years has not been sufficient to meet those goals.

Although the arguments of the developing states are not without merit, the better strategy is to follow a `unified approach' that combines a uniform standard of care with assistance and a generous transition period to accommodate the realities facing developing states. This unified approach would involve: establishing one set of international-liability standards that would be equally applicable to all states, regardless of their economic status; establishing contemporaneously a meaningful aid program--including the participation of appropriate international aid organizations--to assist developing states in meeting those standards; and allowing developing states greater leeway during the short-term to alleviate any hardship that would be caused if the new standards were to apply without a transition period. This approach would do much to internalize to states making decisions regarding internationally harmful activities the externalities (i.e., the costs or detriments experienced by other states) associated with those activities. It would also be more politically palatable to the developed states, and thus more likely to be realized, than would an approach that allowed unbridled pollution by developing states while at the same time requiring ever stricter and more expensive controls in developed states. Furthermore, because transboundary harm such as pollution is typically accompanied by domestic harm (as even the Douglas Smelter illustrates), the
unbridled-pollution approach, favored by some developing states, would tend to result in neglect by developing states of their moral duty to protect their own nationals from harm. This approach would also more likely lead to barriers to international trade, as states sought to protect their domestic industries from foreign goods whose cost advantage is based partly on the lack of pollution-control or other safety costs. Finally, it is not clear that meaningful standards capable of principled application could be devised on the basis of wealth differentials.

d. Viability of a Liability Regime

Recent events do reveal one point of true consistency among states: they are reluctant to agree to any standards of liability for transboundary pollution. Although the historic Principle 21 of the 1972 Stockholm Declaration places a "responsibility" upon states to prevent transboundary harm, states have sidestepped the issue of liability. Stockholm Principle 22 mandates only that states "co-operate to develop further the international law regarding liability and compensation" for the victims of transnational pollution. But, as one commentator notes, "[s]ince 1972 little has been done to further develop the international law of liability and compensation." Indeed, since 1972, conventions on marine pollution have deferred the issue of state liability for extraterritorial injury. Yet publicists still doggedly look to Stockholm Principle 22 as their inspiration for codifications of international liability principles.

The nuisance-like standard of the sic utere principle cannot a priori answer the crucial question of what level of environmental damage constitutes unacceptable damage, nor can it sufficiently describe what exercise of a state's rights causes unacceptable harm. By answering these questions independently, judicial decisions could give content to the normative principle. The lack of international case law, however, leaves a substantive void. Publicists have attempted to fill this void by defining the standard of performance required of a state in preventing transboundary pollution.

In choosing between negligence and strict liability as the standard of care, publicists have ignored the practical realities involved in applying either doctrine. Commentators have endlessly debated abstract legal questions such as whether Stockholm Principle 21 supports strict liability, or whether Trail Smelter and Lac Lanoux serve as solid precedents for negligence. In this way, international legal scholars construct their systems from the sparse material of international tribunal decisions and charter declarations instead of proceeding from the basic building blocks of concordant state interests and aspirations. An examination of the practicality of negligence and strict liability standards reveals the difficulties of the publicists' enterprise.

International law has traditionally conditioned the imposition of state responsibility on a showing of negligence. In the 1929 Mecham case, for example, the Mexico-United States General Claims Commission found responsibility by determining "whether what was done shows such a degree of negligence, defective administration of justice, or bad faith, that the procedure falls below the standards of international law." Yet the negligence standard poses great difficulties in international environmental law. Domestic courts have codified yardsticks, such as Learned Hand's famous "BPL" formula, to endow the concept of negligence with determinate content. But these standards, notwithstanding their mathematical polish, have defied uniform application, because controversial value judgments inevitably seep into evaluations of costs and utility. The indeterminacy and subjectivity of negligence resist codification. Negligence epitomizes the paradox of creating a universalist system from a radically subjective concept.

This paradox hampers the formation of the consensus required for a functioning international liability regime. A negligence-based regime for international environmental law would require fact-driven inquiries in adjudication and a subsequent determination of the reasonableness of a state's conduct. If states held similar normative views of the meaning of negligence, conceivably a negligence-based regime could overcome its subjectivity through the shared understandings among those states. But just as judges within a particular domestic judicial system may interpret negligence differently, the cultural, political, and economic dissimilarities between nations may preclude uniform understandings of negligence internationally. For a liability regime that necessarily functions through findings of the legal standard of care, the subjectivity that attaches to interpretations of negligence places the adjudicatory body in a dilemma. If the tribunal imposes liability, it will do so only by positing norms that do not correspond to the interests of many of the states whose participation remains crucial to the enterprise. Should the tribunal consistently find no liability, the liability regime imposes no obligations and serves no useful purpose.

These difficulties with the negligence approach have prompted many modern commentators to posit a standard of strict liability for transboundary pollution. Strict liability would grant redress automatically after the occurrence of significant injury. For its proponents, strict liability garners the legitimizing cachet of objectivity. But the disjunction between strict liability and states' interests precludes an international consensus for strict liability:

[T]his automatic right to redress, so attractive to victims of pollution, . . . makes many industrial States
mistrust the system. . . . In addition, such an automatic right ignores the special geographical situation in certain countries; for example, in the case of one-way pollution of an international river, the upstream State would have to continually pay compensation for the exclusive benefit of the downstream State. Strict liability is anathema to developing countries as well. Developing states often lack the information needed to predict the extent of transnational harm that will result from domestic activities, especially the activities of foreign entities upon whom these states often rely for economic development. By increasing the costs of industrial operations, strict liability may also hinder developing states' ability to compete internationally and thus impede their economic growth.

Strict liability, moreover, can never fully escape the subjectivity that disables negligence as a basis for a universalist regime of international liability. The blanket imposition of liability for all transboundary harm would create an unimaginably complex and unworkable system. Yet separating out those "ultrahazardous" activities and those "significant" environmental harms that compel the application of strict liability requires a case-by-case balancing between the risk and utility of particular conduct. "Almost all human activity and technology may affect the environment," writes one scholar.59 "The problem then is to weigh the benefits of such activities, and the costs of controlling them, against the probable environmental consequences." Defining the conduct that triggers the application of strict liability necessarily reintroduces subjectivity into the inquiry.

5. State Liability and Economic Efficiency

State responsibility and liability are not clearly defined with respect to environmental degradation. But a limited number of cases and declarations by international tribunals do point in a definable direction. In the famous Trail Smelter Case, the tribunal declared: "A State owes at all times a duty to protect other states against injurious acts by individuals from within its jurisdiction." The Organization for Economic Cooperation and Development (OECD) adopted the "polluter pays" principle (PP) in 1972, which states that the waste discharger must pay for any ameliorating measures which are caused to be undertaken. This principle does not apply to any residual damages which remain. However, the German government has recently issued an interpretation which requires payment of an effluent charge which presumably, in some manner, is meant to reflect remaining damages within German territory. The Stockholm Declarations could also be interpreted as placing responsibility upon those undertaking the actions which result in environmental degradation, although the emphasis is upon "common action" among states. The tendency then is to interpret state responsibility as requiring that states within whose boundaries harmful actions occur must pay or cause to be paid the cost of ameliorating those actions and, possibly, must pay for the remaining damages as well.

In this paper, we shall define and analyze four major principles of assigning state responsibility and discuss the economic meaning of those principles. The first principle is that each state is responsible for all waste discharge control costs internally and externally but is not responsible for compensation of remaining damages following installation of the agreed-upon controls. This is a variant of the OECD principle cited above in that we apply it, as an area of major concern, to transfrontier pollution problems; application of the principle to such problems was explicitly excluded by OECD member nations. The second major principle is the full costing principle (FC), which requires the state responsible for waste discharge to pay compensation for remaining damages as well as control costs. The third principle is the "victim pays" principle (VP), which requires the affected state to compensate the affecting state (or internal parties creating harmful residuals) for all costs of control and to absorb all residual damages after controls are implemented. The fourth principle, in its simplest form, requires the establishment of an internal or international autonomous agency to regulate the joint use of common property resources by individual or multiple states. In the international case, the various states would give powers to the agency to regulate waste discharges into the commonly shared environment. For lack of a better description, we term this principle of responsibility the common property resource institution principle (CPRI).

a. Discussion of Situations

(1) Direct Technological Externalities

The Bilateral Case. We have mentioned four possible principles of state responsibility in the introduction. There are a number of variants of these basic principles. For example, one may have a "polluter pays" principle where paying for pollution is acceptable only through reducing emissions in the polluting country. Or the emitter country may be responsible for damage compensation to receptor countries while the receptors are responsible for paying control costs to the emitting country in addition to their own defensive expenditures.

The current implied legal doctrine that each country must pay for transnational pollution by ceasing activities that cause it may for various reasons (including the difficulty of estimating damages, especially internationally) be adopted as the best practical type of polluter pays principle, but it can be shown to be inefficient in many instances. Let us suppose that agriculture in Arizona is very much more productive than downstream in Mexico and that the
only way to reduce salt content downstream is to take land out of cultivation upstream. Then the current legal
dow, pays the damage costs as a foreign buyer. In the short run, the domestic market price is too low and the
emitter country is a net importer. Thus, for the emitter country, a PP principle with compensatory flexibility
will be more efficient, since the agricultural production across both countries could be maintained at a higher level
and the parties involved could share the gain through compensation arrangements to the betterment of both.

Under certain simplified conditions, it can be shown that the VP and PP principles applied to transnational
pollution problems both produce Pareto efficiency in the short run and the long run if consumers and factors of
production are immobile internationally. The only difference between the two is in the international distribution
of income. This result might lead one to favor the VP principle for the simple reason that it can be implemented
without international enforcement machinery which in the past has proved so intractable. The damaged party has an
incentive both to get information and to bargain with the sovereignty within which the offending activity is taking
place. The principle also has the advantage that the willingness of the affected sovereignty to pay for reduction
provides a quantitative estimate of the damage loss, which might otherwise be very hard to calculate. But aside from
the fact that most people would probably consider the arrangement quite inequitable, it has another basic flaw. If the
VP principle is applicable, the externality-generating country may threaten (by giving high estimates of future loads)
to discharge materials as an incidental aspect of the production of other goods simply to obtain compensation for not
doing so. One may hypothesize that polluting material could be produced at a low cost. Thus, if the VP principle
were to be applied, an aspect of state responsibility would have to be structured to remove the incentives underlying
``pollution for profit.''

Of course, under the PP or FC principles, the injured country could also exaggerate its losses, but it is not in
the superior position which would permit it to exact retribution if its demands are not met. Thus, there seem to be
significant preliminary grounds for preferring the FC or PP principles for both efficiency and equity reasons.

Before turning to the multilateral case, we should point out that the theoretical symmetry among the PP, FC,
and VP principles indicated above is dependent upon the assumption (usually made in the classical international
trade literature) that resources are immobile internationally. If this is not the case, capital or labor movements will
cause the outcomes of the principles to differ.

We now proceed to a rather technical discussion of the efficiency properties of the various principles in the
context of an international economy. The most efficient operation, use, or allocation of a common property (CPR),
be it national or international in impact, is to design a management-ownership-rights solution which will operate to
maximize global rent of the CPR. A full costing principle means that there is a payment between emitter and
receptor countries, with the normal presumption that the emitter country will tax (and/or require emissions contracts
from) internal polluters and the receptor country will provide payment to the internal damaged parties. In this case,
the countries act as neutral (and presumed costless) allocators of funds, but in so doing they perpetrate international
inefficiencies unless one or both governments take additional control measures. The inefficiency occurs because
other governments or private negotiators are not directly and competitively involved to remove the distorting impact
on profit rates of firms or consumer prices. In consequence, with resources internationally mobile, resources will be
inefficiently allocated in a global context.

A rigorous proof of this assertion is given elsewhere. What we wish to do here is provide a heuristic argument
justifying this conclusion for the bilateral case where emissions from the emitter country’s firms raise production
costs in the receptor country. To make the case simple and tractable, we shall omit considerations of control costs
for the emitter country or defensive expenditures by the receptor country. Thus, reduction in damage can only come
about through reduced production in either the emitter or receptor country. We shall also assume that damage costs
increase at an increasing rate with increased output of firms in the emitter country for any positive and constant level
of output by firms in the receptor country.

If the firms in the emitter country are taxed by their government according to total damages, total damage
payments will be less than optimal damage payments because of the assumption of increasing marginal damages
with increasing input. The net effect is to decrease the average cost in the emitter industry below that of the optimum
but above average cost without compensation. Thus, at the zero profit point for each firm where average costs are
minimized, output per firm is necessarily lower than the optimum, while price is also lower. Both price and output
per firm are below what is optimum for the emitter country, and this implies that total output is too large for the
industry taken as a whole. This result occurs because price for the country’s output can only be lower than the
optimum if industry output is larger than the optimum, given that market price falls with greater quantity delivered
to the market. Thus in the emitter country the price of the domestic product is too low and the production is
excessive, which means, if there is international mobility of resources, that too many resources will be utilized there.
A parallel situation arises in the receptor country. Since all firms are now totally compensated for damages, average costs are lower than they would be if payments were made contingent on marginal damages. The net effect is to cause firms to produce at a lower price and lower output, but by the arguments given above, total output in the receptor country must be excessive. In consequence, there is an over-allocation of international resources to the receptor country as well. What we observe is a distortion in the international flow of resources resulting from an implied non-competitive use of the CPR linking the emitter and receptor countries.

The FC principle could be made efficient, allowing for international mobility of resources, if the emitter country taxed its own firms according to marginal damages and then refrained from paying the receptor country, or if for some reason the receptor country's government was convinced that damage payments would not be related to the internally affected industry. It might be easier in an international context to get agreement on the FC principle if a stipulation of no transfer of fund among states was accepted.

With the PR principle, we observe international distortions with mobility of resources even if the level of emissions is agreed upon in advance. Here average costs of the emitting firm rise by less than optimum, since residual damages are not compensated. The net effect is likely to be a less-than-optimal price and output per firm in the emitting country and thus excess international resources committed in the long run. The receptor country's firms have reduced damages but are not compensated for residual damage. In consequence, average costs will decrease but it is uncertain whether the decrease will be greater or less than what is globally optimal.

Under the victim pays principle, average costs of emitters are below the optimum and, through higher short-term profits, entry of new firms will be encouraged. With international resource mobility, new firms will continue to enter until excess profits are eliminated. But as the number of firms expands and prices decline, the amount the receptor country's firms pay will increase to the point where profits are negative or at least not excessive. The long-run adjustment therefore should generally lead to excessive resources being committed to the emitter country and too few resources to the receptor country. Such a situation may also not be stable, since at equilibrium firms in the receptor country must make excess profits to pay compensation, and without further governmental regulation it will be advantageous for individual firms at the margin to break away from the coalition and not pay their share of the compensation. This condition occurs because, with increasing marginal damages, the amount paid by any one firm will exceed its losses at the margin by being subject to an additional amount of waste discharge.

The Multilateral Case. With multi-country environmental problems, assessment of the efficiency of the previously stated principles in allocating global resources is much less clear than in the bilateral case just analyzed. As an example, consider one upstream country with waste discharges affecting two downstream countries. With the FC principle, there is the problem of arriving at an agreement between the downstream countries about which is damaged the most and which should consequently be compensated the most. The PP principle contains similar problems in that there must be joint agreement on acceptable levels of upstream control. Finally, the VP principle is fraught with so-called "free-rider" problems in that, if one country provides a substantial amount of the necessary controls, the second downstream country receives reduced damages at no cost. If, in general, there are more receptor countries than emitters, then it will be more difficult, in terms of coordination, for a solution to emerge under the VP principle than under the FC principle. This result follows because the agreement on compensation requires a greater number of sovereignties arranging to make a payment, which inherently seems more difficult to negotiate than those same sovereignties agreeing to receive a payment.

Summary. The various principles of state responsibility have substantially different impacts on the global efficiency of resources unless there are no transfers of resources among nations. With no transfers or movements, the various principles tend to affect only the distribution of wealth among nations. In terms of allocative efficiency, the "best" principle would be one of converting all CPRs to internationally operated and regulated resources. But such a conversion may imply substantial changes in wealth and therefore may be unacceptable. The principle with the most desirable efficiency properties would appear to be a modified FC principle where the emitter country's government taxed internal firms according to receptor country damages but did not provide compensation to the receptor country.

B. Particular Transboundary Pollution Regimes

1. Transboundary River Pollution

Water is precious for industry, for transport, and for life itself. "More than three-quarters of the land-surface of the globe is susceptible to integrated river basin development." Potential exploitation is thus huge, but so is the area of potential conflict. A single river may be subject to many incompatible claims and uses, and when it flows from state to state, it creates a natural as well as an economic interdependence among riparian states. Moreover, the fact that "international boundaries were often drawn without consideration of the requirements for sound water
administration," aggravates the possibility of conflict.

In this economic context, river pollution has become a new and crucial problem. The same river may be essential for the provision of power for factories, chemicals for industry, sewage-disposal of cities, and the water supply of a nation. The problem of how to reconcile these divergent uses has arisen relatively recently in the international community as a result of intensive industrial development and a global population explosion.

Some hypothetical questions will indicate the scope of the present inquiry. In the simple situation in which a river flows from state A into state B, is A ever liable to B for damage done by pollution? Is damage to sovereignty sufficient to incur liability? Is liability for pollution strict, or may A successfully plead absence of fault? May A rely upon effective and continuous use of the river as a sewer with the knowledge and acquiescence of B? Alternatively, may B set up its long use of the river for domestic or industrial needs, and thus prevent A from changing the condition of the water? What remedies are appropriate? How is the situation different when there is a multi-riparian river basin belonging to states A, B, C, and D, which is being polluted by one or more states?

Are A and B under a legal obligation to contribute to the cost of abating pollution, where C and D are proposing such an abatement project? How are the conflicting uses of the basin by the riparian states to be reconciled? Is the application of formal legal rules as appropriate here as in the simpler situation, or are other regulatory techniques preferable? It is not claimed that these questions will be answered confidently, but it is useful to pose them before examining how far they can or should be answered by international law.

a. Theoretical Background

The problem of state responsibility in international law for extraterritorial damage did not concern publicists before the Industrial Revolution spread throughout Europe in the 19th century, though the early literature contains maxims which bear upon the subject. Grotius, for example, qualified his statement of the sovereignty of riparians over a river, with the interests of the community as a whole, though it is clear that he was not considering the international situation. Subsequent literature consistently developed a limitation upon the use of international rivers, epitomized in the maxim *sic utere tuo ut non alienum laedas*. In the 19th century, some advocates of state sovereignty regarded the use of such waters as unlimited, but their views were not generally accepted.

It was inevitable in a pre-industrial age that the problem of pollution of international rivers did not arise. Indeed, there is no indication that it was regarded as a problem even within the domestic context. The 17th and 18th-century concepts concerning the economic use of water seem to have been transplanted from Roman law. In the 19th century, the principal development related to free navigation on the Danube and the Elbe. In mid-century there was interest in the economic use of navigable waters, but in 1911 the Institute of International Law recognized that "the exploitation of water for industrial, agricultural, and other purposes, remains outside the provisions of the law."

Precisely on account of the primitive state of international river law in the late 19th century, Judson Harmon, the US Attorney General, was able to reply to Mexico's protest against diversion of the waters of the Rio Grande in 1895 that

The case presented is a novel one. Whether the circumstances make it possible or proper to take action from considerations of comity is a question which does not pertain to this Department, but that question should be decided as one of policy only, because, in my opinion the rules, principles, and precedents of international law impose no liability or obligation upon the United States.

Eight months before Harmon enunciated his notorious doctrine, the United States appealed to Great Britain to ensure that waters within Canadian territory were not diverted so as to damage the United States. This was not consistent with a view that an upper riparian state may deny the principle *sic utere tuo* to the detriment of the lower riparian, and indeed Harmon did not attempt to ground his doctrine upon existing state practice. The position of the United States as lower riparian for the first time, in the Columbia River dispute, reveals the unacceptable implications of such anarchic claims. Indeed, from a strictly logical point of view, it is inevitable that unlimited exercise of sovereignty by an upper riparian state must limit the equally important sovereignty of the lower riparian state. Some publicists seem to have committed the reverse logical fallacy of asserting the *absolute* territorial integrity of the lower riparian state. However, *sic utere tuo* appears to be recognized in the literature as a principle of international river law, whether on the basis of "equitable apportionment," "natural justice," or state practice.

It is necessary to emphasize the existence of a general obligation upon a riparian state to respect the rights of its neighbors in the use of international rivers, since otherwise the problem of river pollution is of no concern to international law.

State responsibility for extraterritorial damage to the territory of another state has been based upon the concepts of neighborhood, abuse of rights, and international servitudes.

A. Neighborship. The concept of neighborship implies reciprocity. It has been described as the justification for limiting the sovereignty of a riparian state over its rivers, and has been applied specifically to international river
pollution. Neighborship derives from the physical interdependence of contiguous states. It is usually regarded as imposing the duty upon a state to suppress sources of extraterritorial damage. However, despite reference to the concept by writers on pollution, it has been admitted that there are no precise rules for determining rights and duties flowing from neighborship in concrete situations. The concept may explain or amplify the principle *sic utere tuo*, but it seems incapable of facilitating the solution of problems of international river pollution.

**B. Abuse of Rights.** The development of this controversial doctrine from French jurisprudence has been traced by Politi. The theory is a combination of notions of individual and social fault. It is not always clear whether it is wrongful intention, or the gravity of injury, or social harm, or all these elements which constitute the abuse of a right, and indeed there appears to be little consistency in the theoretical descriptions of the doctrine. Other than in emphasizing the relevance of intention and of reasonable user, the doctrine is of little value to the present inquiry.

**C. International Servitudes.** It is unnecessary to enter into the controversy concerning the place of international servitudes in international law. Some writers have acknowledged that such permanent obligations, in derogation of the sovereignty of the servient state, may be acquired by express or implied agreement. The right of a lower riparian state to receive the waters of a river flowing from an upper riparian state into its territory has been described as creating a "natural servitude," independent of consent by the upper riparian.66

Many doubts surround this doctrine, which has been described as pervaded with "extreme confusion." In particular, the absence of state practice and lack of theoretical elaboration of such matters as the necessary period of open and continuous user by which to acquire prescriptive rights *in rem*, may be cited in opposition to the doctrine. However, for present purposes the principal consideration is the relevance of the concept in international river law.

The essence of a servitude is its permanence. Thus, whether state Y possesses the servitude of polluting a river flowing into state X, or state X has the servitude of receiving water from the river; flowing from state X unaltered in quantity or quality, the subservient state will be permanently restricted in its use of the river waters. It will be irrelevant that a new city develops in X or Y with urgent drainage or consumptive needs; the fact that no serious damage will result to the dominant state from a change in the use of the water will also be immaterial. In municipal law such unqualified assertion of property rights at the expense of community interests has been rejected. This is inevitable, for the essence of private property rights, their permanence, would restrict the process of industrialization. If this is so within separate states, it is submitted that it applies with even greater force in the international community. If a state bound itself permanently against using its river for certain purposes, it might sacrifice the needs of its future towns and their inhabitants.

This brief survey of the theoretical background to the problem reveals little of positive value. The principle *sic utere tuo* is asserted and explained in various ways, but essentially it amounts to a plea for reasonable user of natural resources.

There have been only two disputes over the economic use of international rivers which have been resolved by judicial decision, and neither concerned the problem of pollution.

The more significant decision was given recently in the *Lake Lanoux* case.67 Spain had claimed that a French proposal to divert the waters of Lake Lanoux as part of a hydro-electric project violated the Treaty of Bayonne, 1866, and an Additional Act of the same date. France asserted in defense of the scheme that the diverted water would be returned to the River Carol, which flowed from Lake Lanoux into Spain, and that, since the diversion involved no change in regime in Spain, the matter was wholly within French competence and Spanish consent was unnecessary under the treaty. The Tribunal was mainly concerned to interpret the treaty, but its reasons for rejecting the claim of Spain were stated more generally in terms of international law:

> It could have been argued that the works would bring about a definite pollution of the waters of the Carol or that the returned waters would have a chemical composition or a temperature or some other characteristic which could injure Spanish interests.68

Failure to produce such evidence of injury barred the claim. A state could not rely upon a mere change in the flow of an international river it had to prove actual damage. As for Spain's contention that, under the treaty, her prior consent was necessary for any change in the existing regime, the Tribunal declared:

> To admit that jurisdiction in a certain field can no longer be exercised except on the condition of or by an agreement between two States is to place an essential restriction on the sovereignty of a State, and such restriction could only be admitted in the presence of clear and convincing evidence.69

The *Lake Lanoux* case thus examined the question which the Tribunal in the *Trail Smelter* case had not found it necessary to consider, namely, whether a riparian state may stand upon its strict sovereignty, without proof of damage, and may impose a veto upon any change in the *status quo* proposed by another riparian state. In rejecting such an unqualified assertion of territorial integrity, the Tribunal approved of the relative balancing of conflicting interests, recognizing the need for change and compromise inherent in international river law.
The international cases reinforce the conclusion reached earlier that the essence of international river law is the accommodation of conflicting uses, by compromise and a balancing of interests, rather than rigid rules, which would create stagnation and inefficiency in the exploitation of water resources. They are, however, too few in number, and too closely tied to the unique characteristics of the particular river dispute to provide elaborate norms of international river law.

The most detailed regulation of the use of international rivers is provided by the vast number of agreements which have been concluded between riparian states.

There are several treaties in which any alteration in the existing regime which will affect water flowing across the boundary, is prohibited, unless done with the consent of the other high contracting party. Such embodiments of the principle of territorial integrity, if interpreted narrowly, might confer an unreasonable power of veto on one party, even where it would suffer no injury as a result of change, but the Tribunal in the Lake Lanoux case indicated that interpretation of these agreements should be liberal, and that the burden fell heavily upon the party withholding consent to show that the proposed change would be unreasonable. Other treaties prohibit pollution absolutely, and it is difficult to ascertain whether a court would interpret them literally. Others prohibit pollution insofar as it damages a particular use, such as fishing. Many other treaties adopt a relative criterion, and prohibit damage resulting from the unreasonable use of the waters. It is to be hoped that, since the essence of the use of international rivers is compromise and co-operation in accommodating differing uses and changing needs, these will be models for future treaties. Such an approach typifies the recent agreement which settled the complex dispute between India and Pakistan over the waters of the Indus River. However, the same treaty also contains a clause (Article 11(2)) expressly denying recognition of any general legal liability resulting from the signing of the agreement, like those in United States treaties with Mexico and Canada, and to that extent preserved the Harmon Doctrine.

More specific guidance for the framing of legal norms for combating problems of international river pollution is provided by the implementation by the United States and Canada of the 1909 Boundary Waters Treaty, in which it was agreed “that the waters herein defined as boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other.” An International Joint Commission was established to supervise use of the waters under this agreement, and, since it considered the problem of trans-boundary pollution in great detail, reference to the work of the Commission may be useful. It illuminates the kinds of legal problems which may arise internationally rather than the significance in international law of treaties regulating the use of rivers.

The Joint Commission first examined the problem of pollution in 1913, and in its most recent report in 1951 it stressed the changes in the type of pollution which had occurred in subsequent years.70

Certain aspects of its report are, however illuminating for the development of international law. In particular, the following points may be emphasized:

(a) The high contracting parties to the 1909 Treaty found it necessary to implement the general provision against pollution by establishing a Joint Commission, and ultimately recognized the need for specific criteria for water-quality control.

(b) The Commission, while singling out certain practices for explicit condemnation, generally relied upon the formulation of a complex set of water objectives for the solution of the problem.

(c) Pollution changed considerably in character in accordance with increasing industrialization. Any controlling criteria therefore had to be dynamic.

(d) The effects of pollution varied greatly. The presence of tiny quantities of certain polluting sources could cause extensive damage. Some sources permanently excluded the use of water; others made the expense of abatement prohibitive.

(e) The Commission could not accurately apportion the responsibility of the riparian states for pollution of the boundary waters.

b. Federal Analogies

It is elementary that there is a major difference between the river disputes of unitary and federal states, since sovereignty is involved in the former as is not in the latter. Nevertheless, even though federal states are not sovereign in international law, they possess many of the attributes of sovereignty. The Tribunal in the Trail Smelter case expressly assimilated federal and unitary states, in considering the problem of international pollution, and cited United States decisions as authority in its reasoning.71

United States federal law provides the richest source of judicial decisions on interstate river disputes. Despite the fact that the States of the Union are only “quasi-sovereign,” the Supreme Court has treated them in these disputes very much as though they were sovereign states. It has regarded a State, seeking an injunction restraining a neighboring State or its citizens from causing trans-boundary injury, as acting parens patriae “to protect the general
comfort, health, or property rights of its inhabitants."

The Court has refused to grant injunctions which would prohibit a State from damaging another State in the future, by pollution or otherwise, whereas it has intervened on behalf of a State which sought equitable apportionment of the use of the interstate water resources. However, where a State sought an injunction against a private corporation rather than another State, to restrain out-of-State activities which caused trans-boundary damage by pollution, the injunction was granted, in accordance with the State's protective role towards its inhabitants. In this last case it was clearly easier to grant injunctive relief, since only one State was a party. Where two or more States are parties and the claim is reasonable, the Court has attempted to balance the conflicting uses of the interstate waters, and its approach has been characterized by realism and relativity.

European federal courts have recognized similar principles. In several Swiss intercantonal decisions, the doctrine sic utere tuo was upheld against unreasonable trans-boundary encroachment. The German court expressly applied rules of international law in a dispute between Wurttemberg and Baden over the lowering of the level of the Danube, in which Wurttemberg sought prohibition of the construction of certain works by Baden. It stated that:

the exercise of sovereign rights by every State in regard to international rivers traversing its territory is limited by the duty not to injure other members of the international community.

The function of the court was to weigh the advantage accruing to the defendant state against the injury to the plaintiff state, and, in view of the common interests of citizens of both states, each had a negative duty ``to abstain from altering the flow of the river to the detriment of its neighbors,'' and a positive duty ``to do what civilized States nowadays do in regard to their rivers.' The Italian Court of Cassation has also recognized the principle sic utere tuo, though it is unclear whether the basis of its reasoning was international law or comitas gentium.

It is not relevant in this article to consider the various forms of municipal regulation of pollution which have been attempted. However, it should be noticed that, in the Federal interstate context in the United States, regulatory machinery has been established in a series of interstate compacts. These compacts create interstate commissions, and contain elaborate standards for the guidance of the commissions. The New England Pollution Control Compact, 1947, Article 5, is typical of the approach of these agreements to the pollution problem. It recognizes the impossibility of framing simple standards of water quality in view of the variety of uses and abuses to which rivers are subject, but recommends that the Commission shall establish ``reasonable physical, chemical and bacteriological standards of water quality satisfactory for various classifications of use.''

c. Conclusions

Some tentative conclusions will now be hazarded concerning the control of river pollution by international law. They are offered with some diffidence, de lege ferenda, for the present inquiry should at least have exposed the primitive stage of development of existing international river law. It can be stated confidently, de lege lata, that the Harmon Doctrine is not a generally recognized principle of international law, and that there is liability for action incompatible with the general principle sic utere tuo. The doctrines of neighborship, abuse of rights, servitudes, and equitable apportionment stress elements which should be taken into account in the elaboration of river law, but they themselves do not provide specific legal norms.

Pollution problems appear to change in character as societies become more industrial. An international river which was hitherto been used for a few compatible purposes becomes, in a modern state, subject to complex and conflicting uses which must somehow be reconciled. Riparian states depend more heavily upon water resources, and the complexity of their needs makes them interdependent. Industrial and chemical pollution can cause enormous damage from relatively-small polluting sources, and yet, within a river basin, it may be impossible to allocate responsibility for injury among the several riparian states. When abatement schemes are proposed, contribution payments have to be assessed on the basis of factors which are complicated and fluctuating. The changing uses of the river by riparians may demand dynamic rather than static water-quality objectives. In this complex situation, a regulatory rather than an adjudicative process would seem appropriate. An international administrative agency, with the power of continuing discretion, would have sufficient flexibility to cope with such problems. It is doubtful whether a forum of third-party adjudication could provide suitable remedies, even if it could adequately assess responsibility in legal terms. ``A man dying of thirst cannot be revived with monetary compensation for his water, even when tendered in advance.'' And similarly, it is doubtful whether injunctive relief could provide sufficient flexibility and compromise. It would clearly be inappropriate to prohibit any use resulting in trans-boundary injury, but it would also seem impossible for a tribunal to frame and enforce water quality objectives related to future uses, which cannot be anticipated. For these reasons many publicists have advocated the establishment of regional commissions to control the use of international rivers. The International Joint Commission's work in regulating the United States and Canadian boundary waters is an excellent example of the value of such administrative machinery.
United States interstate compacts and the entire trend of municipal law in technologically developed states towards administrative regulation, provide further evidence of the necessity for the exercise of continued discretion in controlling complex uses of natural resources.

However, if it is weakening to invoke international law indiscriminately, it is undermining the basis of law to suggest that all international disputes over the economic use of international rivers should therefore be decided by regional commissions. There will be many cases of extraterritorial injury by pollution which will not require administrative regulation. Where, for example, an international river is subject to simple, defined uses, and is not part of a complex integrated basin, pollution of the waters may be the subject of adjudication, and there seems no reason why international law should be incapable of furnishing adequate controlling rules and principles.

If, then, in the majority of cases, the plaintiff starts with the presumptive rule in his favor that every state is bound to use its rivers in such a manner as not to injure territory of riparian states, the burden will fall upon the defendant state to establish some appropriate defense. The presumption in favor of the plaintiff would seem reasonable, in view of its difficulties in obtaining necessary evidence, and the fact that, at least prima facie, there had been some violation of its territorial integrity. However, it would also seem reasonable that the plaintiff should show at the outset that there had been substantial injury, since "one of the conditions of the good neighbor principle is the duty to overlook small, insignificant inconveniences," and a state should not be permitted to bring an international claim without serious cause. It is true that it has been suggested that damage might be recovered, even where no pecuniary loss had resulted to a state or its nationals, as "a means of declaring which of the two contending parties was acting consistently with the law," but it is submitted that, in the area of the economic use of international rivers, the need for reasonable compromise is greater than purely formal definitions of legal rights, and that serious injury should therefore be shown before an international claim be recognized. The burden will fall upon the defendant state by implication from its exclusive sovereign jurisdiction over waters flowing within its territory, but it is not sufficient for the plaintiff to show an alteration in the quality or quantity of water without also showing serious consequent injury.

The minimum duty demanded of the defendant state in international law would surely be "to require that its citizens observe provisions which are otherwise enforced in its territory to prevent pollution." Where a state's regulation of its rivers falls below what is customarily regarded as reasonable by the majority of members of the international community, it is likely that its own standard would not be considered adequate for the international minimum standard. A difficult problem would, however, arise where the river, which had been polluted, was so insignificant as to be of a kind usually not stringently controlled by other states.

The defendant state, in attempting to establish appropriate defense, could, with justification, usually plead that a number of factors be taken into consideration. In assessing the degree of injury to the plaintiff an international tribunal might be asked to balance the needs of the states concerned. It would take into account the benefits to the plaintiff of use of the waters and the standard of care which it demanded from its own nationals in the use of domestic rivers. Absence of protest by the plaintiff against continuous and long use of the river as a sewer by the defendant, might be evidence of lack of sufficient injury to the plaintiff, though it is unlikely that such acquiescence would be held to have created a permanent prescriptive right in the defendant to continue to pollute the river. In addition, where "one of the parties wishes to change the existing legal situation on the ground that it is inequitable and contrary to objective justice," the tribunal might have power to render a judgment ex aequo et bono, after weighing the relative interests of the parties. Indeed, it would seem that in most cases of international pollution the tribunal would necessarily give its decision in terms of the equitable interests of both parties, unless the injury complained of was an isolated incident or was done deliberately or recklessly. The continuing interests of the riparian states in use of the international waters would have to be taken into account in the judicial assessment of the merits of the case. It was stressed earlier that, as the uses of the river become more complex and interdependent between the riparian states, it would appear appropriate for considerations of compensation and efficiency of exploitation to replace more simple questions of culpability and responsibility. It may become impossible to allocate responsibility; problems of framing water-quality objectives and assessing fair apportionment between the parties of abatement costs may demand a continuing future discretion which the adjudicative process will be unable to provide. The perception of the areas in which legal rules are appropriate or inappropriate is vital to the healthy development and elaboration of international law.

2. Transboundary Groundwater Pollution

Water is unevenly distributed in nature and appears in solid, liquid, and gaseous states. Differing from some other natural resources which may increase—like fish and forests—and from others which may decrease—like oil—the total volume of water in nature is fixed and invariable. The total volume of water in nature is about 1.4 billion cubic
Deterioration in water quality, or pollution of water, includes any impairment in composition or content due to the river or the silting up of a lagoon) can lead to the exhaustion of the aquifer. The quantity of water in an aquifer can be adversely affected by impermeabilization, may effect exploitation of the aquifer. The rules applying to groundwater have evolved considerably thanks to progress in hydrogeological research. In the early 1900s, jurists believed that underground water behaved like surface water. Thus, they understood underground water to be similar to rivers, with bodies of water similar to lakes and marshes. Science now believes that most groundwater is found in porous aquifers and that only exceptionally, as in certain limestone soil, do underground water courses similar to rivers exist. Progress in scientific knowledge has exerted a certain influence on law, and it is now generally accepted that international groundwater enters the hydrologic cycle and constitutes shared resources. Because of this, there are treaties and resolutions of international organizations that use the same term or expression (for example, basin, water resources) to comprise both surface and groundwater, and in other cases, reference is similarly made to surface water and groundwater without actually applying a single terminology. In international law there are rules generally applicable to groundwater shared between States, and such rules apply to all shared aquifers, except where specific provisions are made for individual cases. The 1977 United Nations Water Conference approved a recommendation which states: “In the absence of bilateral or multilateral agreements, Member States continue to apply generally accepted principles of international law in the use, development and management of shared water resources.”

a. General International Law

(1) Obligation Not to Cause Appreciable Harm

The harm that one State may cause another in connection with a given aquifer could affect the quantity or quality of the water or its geological structure. The quantity of water in an aquifer can be adversely affected by exploitation in excess of its rate of recharge or by a modification of its sources of supply. Supply modification may occur, for example, if any artificial alteration is made in the volume of flow of a river feeding the aquifer or if any modification occurs in the terrain in the natural recharge area. Such changes (such as an alteration in the course of the river or the silting up of a lagoon) can lead to the exhaustion of the aquifer.

Deterioration in water quality, or pollution of water, includes any impairment in composition or content due to
human agents. The geological structure of an aquifer can be impaired, for example, by underground nuclear testing carried out in a neighboring country. Again, excessive exploitation in certain deep-lying aquifers may lead to subsidence. Deleterious results of this kind may occur if mining activities in a neighboring State include controlled subsidence methods.

International law obligates each State not to cause harm to another. This obligation includes direct State action within its own territory and each State's duty to insure that its territory is not used in a manner injurious to other countries. This rule is reaffirmed in principle 21 of the Stockholm Declaration. Where groundwater is concerned, a number of treaties make express reference to the rule which requires that no appreciable harm should be caused. The question has sometimes been raised whether a State is obliged to carry out certain acts to modify a natural state of affairs which causes appreciable harm to a neighboring country. In other words, does international law only prohibit specific acts which may aggrieve a neighbor or does it also require an affirmative duty to perform certain acts?

The matter was raised in the dispute over the infiltration of the Danube waters. When that river enters the Jura region, a substantial amount of water infiltrates, favored by the limestone in the soil, and some of it later surfaces, to empty into the Aach, a minor tributary of the Rhine. This infiltration occurred in Baden. Wurttemberg, a downstream region, claimed that Baden had an obligation to take the necessary measures to prevent this natural seepage, which was causing serious harm by reducing the volume of the Danube's flow. Baden countered that international law did not oblige a State to alter a natural situation within its borders.

The matter was decided by the Reich State Tribunal, June 17-18, 1927, utilizing international law. The disputants in the case were the Lander in Wurttemberg and Prussia on the one hand, and the Land in Baden on the other. The award states that international law forbids only the causing of appreciable damage to another State, that is, it prohibits harm brought about through human agency. A State, however, is not obliged to modify natural conditions of its soil for the benefit of another State. On these grounds the state tribunal ruled that Baden was not obliged to prevent the Danube seepage as long as it was due to natural causes.

Hence international law prohibits States from causing appreciable damage to other States. Current doctrine extends this prohibition by including not only cases of actual appreciable harm but also those involving serious risk, for example, the siting of a nuclear power station close to international boundaries which endangers boundary aquifers with radioactive pollution.

(2) Groundwater Pollution

According to article IX of the Helsinki Rules, water pollution is defined as any detrimental change in the water's natural composition, content, or quality, resulting from human conduct. This definition appears to require that pollution must be due to human agency. For example, an aquifer fed from a river that naturally washes down in its course a certain amount of boron salts, rendering groundwater unfit for irrigation purposes, is not an example of "pollution." Similarly, when groundwater undergoes a major increase in salinity due to the evaporation occurring in some arid countries, such as the Tafilat Valley in southern Morocco, it is not pollution.

Groundwater pollution can have several causes, one of which is the introduction of chemicals or microorganisms into the aquifers. Human activities having such consequences are varied, including farming, industry, mining, and urban sewage and drainage services.

Industrial activities are another major source of pollution of groundwater. Here the predominant factor is waste--wastewater, solid waste, smoke, and gases. They contain innumerable pollutants such as metals, acids, phenols, cyanides, grease, organic residues, oils, and petroleum.

Urban drainage encompasses evacuation of wastewater and sewage in cities and towns. This waste is produced by domestic activities such as washing and sanitary drainage, public services such as street cleaning and drainage, and by shops and industries.

A further cause of groundwater pollution can be due to the exploitation of an aquifer. In coastal water-bearing layers which connect hydrologically with the sea, and in layers linking up with semi-permeable formations containing saline water, overdraining the freshwater aquifer may lead to saline intrusion, rendering the aquifer unusable.

Groundwater pollution is not regulated by any general agreement. There are, however, private agreements between bordering States which provide regulation for transboundary pollution. Examples of this are the agreement between the USSR and Poland, of July 17, 1964, article 3, clause 7, and the agreement between the German Democratic Republic and Poland, of March 13, 1965, articles 1 and 8.

Treaties may appoint commissions in charge of protecting groundwater against pollution. Sometimes the task is assigned to a joint commission or transboundary waters commission competent to contend with all waterrelated matters. In other cases, treaties set up special commissions to protect water from pollution, their competence extending to groundwater. However, these commissions concern themselves with groundwater only to the extent
necessary to preserve the quality of surface waters.

Reasonable use of a natural resource also implies securing the maximum possible yield. This is referred to as "optimization." Article 3 of the Charter of Economic Rights and Duties of States makes express reference to it. The bilateral agreement on groundwater between the German Democratic Republic and Poland also requires that the users secure maximum yield through optimization.

The apportionment of the benefits among countries sharing an aquifer must also be equitable and reasonable. The distribution must be carried out so that each country obtains the maximum satisfaction for its needs with nonexistent or minimum harmful effects. This does not require a mathematically equal distribution of benefits among the sharing countries, but instead requires distribution according to the needs of each State.

When the equitable utilization rule is applied, the respective States' total benefits and inconveniences caused by groundwater withdrawals must be considered. Thus, an application of the rule may result in an aquifer use that will yield noticeable benefits for several States in terms of water supply for people and livestock, yet will result in appreciable disadvantages to irrigation in a given area of one of those States. Benefits and disadvantages are not assessed separately for the respective uses of water, but rather are done jointly. In this case, allowances must be made not only for economic but also for social and cultural factors as well, such as education, customs, lifestyle of the population, and their own scale of values.

(3) Equitable and Reasonable Use

A State may, within its own territory, make use of groundwater as long as it causes no appreciable harm to another State. This customary rule applies to the conduct of the State that exploits a resource in neighboring territories. The other basic rule governing the use of shared natural resources is that such use must be equitable and reasonable. This idea is commonly expressed in terms of "equitable utilization" or "equitable apportionment." The rule enjoys wide acceptance today and is part of general international law. The concept of equitable/reasonable use for international aquifers should be considered from two standpoints: from the use itself and from the way in which the derived benefits are to be apportioned between States. In other words, the use made of groundwater must be reasonable and equitable, and so must the apportioning of the benefits.

In recent decades, the increasing demand of groundwater, and the adverse effects of excessive withdrawals in certain aquifers, have made States aware of the need to manage and regulate their use according to predetermined needs. In this sense, reasonable use of an aquifer means to preserve the resource by adapting withdrawals to the recharge regime. Likewise, reasonableness is linked to a certain order in the exploitation according to differing requirements. For example, it would be unreasonable to use an aquifer mainly to supply ornamental fountains or boating ponds to the detriment of people who need drinking water.

For the equitable apportionment of shared aquifers, it is necessary to consider the volume of the aquifer in the territory of each State. Where two States share an aquifer, an equitable solution would be that the volume that each may withdraw should be proportionate to the segment of the aquifer lying within its territory. This rule is usually applied in the exploitation of shared mineral resources, such as gas or oil deposits, extending on either side of an international boundary.

Among the specific instruments dealing with groundwater and applying the equitable/reasonable rule is the Treaty of June 9, 1978, between the Canton of Geneva and the Department of Haute-Savoie on the Genevois water table. This treaty appoints a Commission which proposes a yearly program for the use of the underground aquifer specifically geared to the needs of the various users. Likewise, article 10 provides that in order to secure one exploitation rationnelle, each user or group of users shall notify the Commission at the beginning of each year of the volume of water that each proposes to withdraw.

(4) Prior Notice Obligation and the Duty to Negotiate

The applicable rules for international groundwater use are that no appreciable harm shall ensue, and that such use shall be equitable and reasonable. Therefore, if a State is to ascertain whether the project of a neighboring country will cause appreciable harm to groundwater resources or whether the use will be equitable and reasonable, it will need to know about the project. For this purpose, States may establish a procedure whereby each will communicate the plan and the necessary data to the other for determination of the likely effects of the project on the groundwater. The notification procedure consists primarily of the mandatory communicating of intended groundwater withdrawals. This procedure must be the responsibility of an organ of government, even where the actual exploitation of the resource is to be in private hands. The notification must give all technical details necessary for the other States to assess the effects likely to occur within their territories. Notice must be given with enough time for the countries concerned to assess the effects of the exploitation before operations begin, and communicate their conclusion to the notifying State. The notification must be addressed to foreign State authorities and not to private persons, even where the latter are those supposedly concerned.
Secondly, States concerned may make known to the notifying State any objections they may have, together with scientific and technical considerations showing that the intended use will cause them appreciable harm or does not constitute a reasonable use of the resource. As the working of the resource proceeds, the notified States may verify the procedures in the territory of the notifying State to ascertain whether they correspond to the plan originally notified. The procedure described is intended to give prior notice to other countries of a proposed project, but not to require their consent.

b. Particular Cases in International Law

There are certain cases where shared aquifers are subjected to conventional juridical regimes by the States in whose territory they are found. Some treaties provide for a joint-use regime, others for a special regime.

In international law it is necessary to distinguish between cases in which two States exercise joint sovereignty over a given territory and where two States exercise jointly only its use or its exploitation. The former situation is generally referred to as a "condominium," the second as an international "joint use."

In boundary treaties subscribed since the 18th century, one may find provisions dealing with groundwater situated along the boundary lines. To facilitate the use of such water by neighboring populations, it is usual to agree that the boundary line should pass through a spring or a fountain and that the two bordering States may use the water in common.

The international boundary is a clearly determined line, yet there is also a natural resource that is under joint use. This does not require bringing the territory under a condominium, for the community refers only to the use and development of groundwater, but each State continues to exercise jurisdiction within its borders for all other purposes. In the hypothesis of the aquifer drying up, the joint use would cease, and the frontier line alone would continue to be enforceable.

The protection of groundwater is a relatively recent development in international law, but it is following the same general rules applicable to other shared resources. The relevant applicable principles include the obligation not to cause appreciable harm, the duty of equitable and reasonable use, the obligation to provide prior notice, and the duty to negotiate. All these principles are generally accepted customary rules which are now being applied in the context of shared aquifers to ensure their maintenance and protection.

C. Procedural Obligations

1. The Duty to Cooperate, Notify and Consult

The "good neighborliness" of nations sharing natural resources gives rise to some procedural rules to which the countries concerned must submit their conduct. Cooperation with regard to potential or existing transfrontier pollution can consist of a number of modes of conduct, or can refer to a basic attitude in which states deal with each other. A unilateral form of cooperation is the providing of information on environmentally relevant activities to a (potential) victim state. Building on the exchange of information, the neighboring countries concerned can enter into consultations. This bi- or multilateral form of cooperation consists of an exchange of views on the environmental situation in question. Finally, by making use of both information and consultation, states can negotiate the relevant environmental issues. Negotiations require the basic readiness of the polluting state to consider and accommodate the other country's concern. The decision to act itself remains reserved to the polluting country, which is not obliged to actually enter into an agreement. However, the difference between consultations and negotiations is one of degree only and it is not always possible to distinguish the two forms of cooperation. Literature and international documents often do not draw a sharp line between the two. Therefore, they will be discussed jointly in the following paragraphs on the assumption that consultations are a preliminary stage to negotiations.

a. The Duty to Cooperate

International environmental law imposes a general duty on states to cooperate in their use of transboundary natural resources. General Assembly Resolution 2995 (XXVII) stresses that: "...in exercising their sovereignty over their natural resources, States must seek, through effective bilateral and multilateral co-operation or through regional machinery, to preserve and improve the environment,..." A similar duty is stipulated in the General Assembly Resolution 3129 (XXXVIII): "...the duty of the international community to adopt measures to protect and improve the environment, and particularly the need for continuous international collaboration (emphasis added) to this end,..." Further evidence of a general duty to cooperate can be found in, for example, the OECD Recommendation C(74) 224 of November 14, 1974 on Principles Concerning Transfrontier Pollution, Principles 1, 7, 9, 12 of the UNEP Draft Principles of Conduct, Articles 3-5, 7-10 of the 1979 ECE Convention, Articles I ff. of the 1980 Memorandum of Intent between Canada and the United States, the Mexican-United States Agreement on Cooperation in the Border Area, Articles 18, 19 of the ASEAN Convention, and Articles 2, 4 of the Vienna Convention on the Ozone Layer. Whether states are obliged to make use of the aforementioned more specific means
of cooperation, is subject to some dispute.

An interesting point that needs to be mentioned at least briefly is the question of how the means of modern communication influence the distinctions between information, consultation or negotiation. Would, for instance, an exchange of telexes regarding a planned activity of State X with potential transfrontier impact have to be considered as consultation? Or would it be mutual information? Does a telex at all fulfill the duty to inform?

b. The Duty to Notify and Inform

It is generally accepted that states, if they intend to use areas under their jurisdiction or control in a way that may cause significant transfrontier environmental damage, are under a duty to give prior notification to the potential victim. They are also obliged to supply and exchange further information. The duty of states to notify other states of potential danger had already been pronounced in the Corfu Channel case. The rule evolved in the context of shared water resources and was formulated in Article XXX of the Helsinki Rules.

1. With a view to preventing disputes from arising between basin States as to their legal rights or other interests, it is recommended that each basin State furnish relevant and reasonably available information to the other basin States concerning the waters of a drainage basin within its territory and its use of, and activities with respect to such waters. (Emphasis added)

2. A State . . . should in particular furnish any other basin State, the interests of which may be substantially affected, notice of a proposed construction or installation which would alter the regime of the basin. . . . (Emphasis added)

Until recently there was disagreement as to the existence of a generally applicable rule of international law obliging states to inform neighboring countries of potential transfrontier pollution. Some still contend that, in spite of extensive treaty practice, states exchange information or consult each other on an ad hoc basis.

The 1972 Stockholm Declaration limits itself to a very broad reference to information exchange in Principle 20. An earlier draft had included a much narrower formulation of a duty to provide information. However, since at the time Brazil was engaged in an environmental dispute with Argentina, it resisted the incorporation of any duty on prior notification or consultation. The issue was put on the General Assembly’s agenda, and later in the same year the duty to exchange environmentally relevant information was underscored in Resolution 2995: ‘‘. . . co-operation between States in the field of the environment . . . will be effectively achieved if official and public knowledge is provided of the technical data relating to the work to be carried out by States within their national jurisdiction, with a view to avoiding significant harm that may occur in the environment of the adjacent area.’’ In Resolution 3129 of 1973, the duty was even more specifically formulated with regard to shared natural resources: ‘‘. . . co-operation between countries sharing such natural resources and interested in their exploitation must be developed on the basis of a system of information and prior consultation. . . .’’ A similar wording was used in Article 3 of the 1974 Charter of Economic Rights and Duties of States, and Principle 5 of the UNEP Draft Principles of Conduct states that: ‘‘States sharing a natural resource should, to the extent practicable, exchange information and engage in consultations on a regular basis on its environmental aspects.’’

Outside the United Nations context, the most authoritative formulations of the principle of information exchange are to be found in the OECD Recommendation C(74) 224 and especially under Title C of the OECD Recommendation C(77) 28:

(a) The country of origin, on its own initiative or at the request of an exposed country, should communicate to the latter appropriate information concerning it in matters of transfrontier pollution or significant risk of such pollution and enter into consultations with. (Emphasis added)

(b) In order to enable a country of origin to implement adequately the principles set out in Title A of this Recommendation, each exposed country should, on its own initiative or at the request of the country of origin, supply appropriate information of mutual concern. (Emphasis added)

Further confirmation of the principle of information can be found in several bilateral and multilateral agreements. In its Article 3 the MOI between Canada and the United States refers to prior notification of environmental risks or potential risk as ‘‘long standing practice.’’ In Article 4 the two governments express their intention to exchange information on research. References to the exchange of information can also be found in Article 6 of the Mexico-United States Border Agreement, Article 3, 4 and 8 of the 1979 ECE Convention, Articles 18-20 of the ASEAN Conservation Agreement, and Article 4 as well as Annex II of the Vienna Ozone Layer Convention. It is true that many of these documents are only recommendations or are otherwise not legally binding for the signatories; nevertheless, they are evidence of a widely held view that states are under a duty of international environmental law to inform (potentially) concerned states of significant transfrontier harm or a significant risk of such harm.

Examples from European experience illustrate that states are usually willing to supply the relevant
information. In the case of the construction of a nuclear power plant in Fessenheil (Alsace) the French Commisariat a l'Energic Atomique in 1971 eventually agreed to let German authorities participate in measuring radioactive propagation. Through a French-German Commission on the safety of nuclear power plants in the border area, the French government subsequently provided information on the facilities in Fessenheim and in Cattenom.

In other cases of nuclear power plant projects, prior information was supplied to the neighboring countries. In 1977 the government of Luxembourg supplied the German Saarland with information about planned nuclear power plants in the border area. Germany and Switzerland set up an Area Planning Commission and the German delegation furnished detailed information on projected locations for nuclear power plants to be built close to the Swiss border by 1990. A similar Commission, through which information on two plants was supplied to the Dutch government, exists between Germany and the Netherlands.

In summary, the duty to exchange information on (potentially) harmful transboundary (air) pollution can be considered a rule of international law. The difficulty lies in the delineation of the rule's extent. It is not clear what degree of harm or risk is necessary to actually "activate" the duty. State practice points at a relatively high threshold.

These delineation problems do not arise in the case of an emergency, such as a cloud of a poisonous gas escaping from a factory. In an emergency situation states have to supply the information necessary to keep the damage (which as such cannot be prevented) as small as possible. Formulations of a corresponding duty are usually found in agreements concerning international watercourses. Principle 9 of the UNEP Draft Principles of Conduct extends the duty to all shared resources. Its importance is underscored by the formulation "...States have a duty to urgently inform..." which differs significantly from the wording of Principle 5 bearing on information exchange. In Title F of the 1974 Principles Concerning Transfrontier Pollution, the OECD recommends that countries "...promptly warn other potentially affected countries..." in the case of an emergency. The ASEAN Convention contains a similar recommendation in Articles 19 and 20. The duty to notify other states of emergency situations is seldom discussed and hardly disputed as a rule of international law. Accordingly the ILA included it routinely in its Montreal Rules of Transfrontier Pollution (Article 7).

c. The Duty to Consult and Negotiate

It is less clear whether, beyond the duty of notification or information, states are also obliged to consult with potentially harmed neighboring states. Some authors contend that there is a general duty of consultation in transfrontier pollution cases. Others claim that the existing evidence of confirming opinio juris and state practice is, especially regarding air pollution, not sufficient.

With respect to water resources, the principle of consultation is widely accepted as a rule of customary international law. The 1909 Boundary Waters Treaty between the United States and the United Kingdom/Canada provides an early example. With the International Joint Commission (IJC) the parties set up a body which, as one of its major tasks, offered a forum for consultations. Further support for the existence of the principle can be derived from the Lac Lanoux case, in which it was concluded that:

En realite, les Etats ont aujourd'hui parfaitement conscience des interets contradictoires, que met en cause l'utilisation industrielle des fleuves internationaux et de la necessite de les concilier les uns avec les autres avec des concessions mutuelles. La seule voie pour aboutir a ces compromis d'interets est la conclusion d'accords, sur une base de plus en plus comprehensive. La pratique internationale reflete la conviction que les Etats doivent tendre a conclure de tels accords; il y aurait ainsi une obligation d'accepter de bonne foi tous les entretiens et les contacts qui doivent, par une large confrontation d'interets et par une bonne volonte reciproque, les mettre dans les meilleures conditions pour conclure des accords. . .

The principle of consultation has as well been recognized by the International Court of Justice in the North Sea Continental Shelf cases and the Fisheries Jurisdiction Case.

In support of a broader applicability of the principle it can be argued that it emanates from the obligation of peaceful settlement of disputes underlying the United Nations Charter and laid down in Chapter IV. Although duty to engage in consultations or negotiations on transboundary air pollution can certainly not be derived directly from the peaceful settlement principle, the latter does provide a guideline for the conduct of states in the case of a dispute arising because of unlawful transfrontier pollution. A duty to consult or to negotiate would arise under the Charter mainly, perhaps only, if the continuation of the dispute threatened international peace and security (Article 33 United Nations Charter). Thus far disputes about transfrontier air pollution have not represented such a threat.

2. Are Procedural Duties Futile?

The failure to develop an operational liability regime has prompted some critics to denigrate the role that state responsibility may play in international environmental law. These legal experts have found the whole concept of
international adjudication especially inadequate for transnational pollution, because any proposed regime would necessarily operate ex post facto. Any system of liability takes time to deter parties from polluting, because individuals will have to sum up many outcomes of "tort" adjudication to reach a predictive assessment of the potential liability attaching to their actions. According to publicists, current environmental problems pose too devastating a threat for a liability system alone to protect the environment.\textsuperscript{44}

Moreover, many commentators complain that the central characteristic of adjudicatory systems --ex post facto intervention to develop rules for disputes that have already arisen--has a divisive effect on international relations. A liability regime fosters "adversary confrontations" that undermine transnational environmental protection. Indeed, such confrontations run counter to the current model of international law as "govern[ing] a community . . . of states" and as thus depending upon states' mutual cooperation.\textsuperscript{45}

In an effort to forestall significant extraterritorial environmental injury and to avoid the confrontational proceedings inherent in a liability regime, international legal analysts have developed rules of state conduct designed to prevent environmental harm before the harm occurs.\textsuperscript{86} Procedural obligations, including duties to assess potential transboundary harm and to disclose dangerous activities to other nations, have emerged to dislodge the substantive obligation of sic utere as the doctrinal bulwark against transnational pollution. Indeed, the recent proliferation of international treaties and charters imposing duties on states to assess transboundary environmental dangers and to inform potentially affected states of dangers signals the move away from ex post determinations of compliance with legal standards of care toward a new regime of procedural requirements.

Procedural obligations, however, fail to prevent the confrontations that a nuisance-style liability regime would breed. The breach of a duty of prior assessment or disclosure would not subject a state to a claim of liability until after damage has occurred. Thus the shift to pre-injury responsibility fails to prevent pollution any better than would an ex post facto liability approach.

Moreover, substitution of procedural duties for substantive commands ironically limits the role of international law in environmental protection. In itself, an evaluation of likely environmental hazards affords no direction concerning what courses of action will violate international law. A duty to inform mandates nothing; it provides no guidance about whether and how pollution source states should alter their behavior in light of the new information. Adherence to duties of prior assessment and disclosure will scarcely reduce transboundary pollution. Thus, the shift to procedural obligations renders compliance with international law inconsequential for actually protecting the environment.

The move towards procedural duties may in fact legitimate environmentally hazardous conduct. As procedural duties to assess and inform replace substantive commands to prevent significant transboundary pollution, states may discharge their international obligations simply through the production of assessment and information reports. Procedural duties may give a state an implied license to pollute, as long as procedural technicalities are fulfilled.

Finally, by failing to provide any determinate content to the procedural obligations, the new regime compounds the errors that publicists have committed in their attempts to develop a liability regime. The failure to codify the substantive norm of sic utere has stemmed from an inability to maneuver between the dangers of general duties that impose no meaningful obligations on the one hand and specific duties that conflict with the aspirations of states on the other. The proponents of procedural obligations have fallen into the former trap by promulgating a series of vague duties long on hope and painfully short on specifics.

1. Duty to Assess.--Designed to promote environmentally conscious decisionmaking, the duty to assess constitutes the principal procedural obligation imposed upon states. The Lac Lanoux arbitration contains one of the earliest articulations of a state's duty to evaluate the extraterritorial damage that activities within the state's jurisdiction or control threaten to cause. The tribunal stated in dicta that "the upstream State . . . has the obligation to take into consideration the different interests at stake. . . and to demonstrate that . . . it is genuinely concerned about reconciling the interests of the other riparian with its own."\textsuperscript{87} The International Law Association's Montreal Rules on Transfrontier Pollution\textsuperscript{88} urge states to prepare environmental assessments to evaluate the risk of transfrontier pollution posed by a proposed activity. The OECD calls on states providing development assistance to developing countries to subject proposed projects to "in-depth environmental assessment."\textsuperscript{89}

Some state practices similarly recognize the duty of a state to take into account the extraterritorial impact of activities within its national jurisdiction. For example, the Council of the European Communities adopted its final directive on environmental assessment in 1985 requiring appraisal of environmental effects in other member states. In 1983, Canada issued a Guidelines Order\textsuperscript{91} for its environmental assessment review procedures that requires that the "external" environmental consequences of a federal government proposal be fully considered. A 1977 U.S. Executive Order requires that environmental impact statements filed in compliance with the National Environmental Policy Act (NEPA)\textsuperscript{92} be prepared for "all major Federal actions significantly affecting" the "natural and physical"
environment beyond United States territorial control. This evidence prompts one commentator to characterize the duty to assess as the "least controversial" of the procedural duties.

Yet attempts to codify the duty to assess as a customary obligation under international law stumble over the same obstacles encountered with the sic utere principle: unelaborated, the duty to assess remains too general to provide any standards by which one can judge a state's conduct. If the duty is imbued with determinate content, however, states will repudiate the duty as inconsistent with their interests. States have preferred the former result. In 1978, for example, the United States prepared a Draft Treaty on International Environmental Assessments that would have required signatories to prepare standardized evaluations for "major" activities within their territory or a global commons area "which may be reasonably expected to have a significant effect on the environment of other nations or on a global commons area." The treaty would have obliged signatories to submit the environmental assessments to affected states and to UNEP. The proposal has garnered meager international backing, and one commentator notes that the duty "means little without further development and harmonization of evaluation procedures." The environmental assessment requirements that states ratified in articles 204 to 206 of the 1982 Law of the Sea Convention impose a more ambiguous, watered-down duty on states to "assess the potential effects of such activities on the marine environment" and to transmit their findings to "the competent international organizations."

Although designed to nip extraterritorial damage in the bud, the duty to assess imposes no obligation upon states to forego environmentally harmful activities. Assessment requires the determination of costs and benefits of a proposed project; it does not specify how they should be weighed. States may have a duty to consider the transboundary harm of a proposed activity, but no international consensus indicates the weight that national decisionmaking must accord to the "cost" of environmental harm abroad. The dearth of precise criteria precludes the imposition of liability, prior to the damage, for a state's decision to adopt a harmful course of action.

Thus, the duty to assess remains a purely procedural obligation that creates no opportunity for judicial review of either the substantive merits of the consequent decision to act or even the procedural adequacy of a state's assessment of extraterritorial effects. Indeed, national decisionmaking pursuant to a state assessment has remained largely immune from substantive challenge. Notwithstanding the unusual tradition of active judicial review in the United States, courts in this country may review agency decisions based on environmental impact statements only under the "arbitrary and capricious" standard. Some United States courts, however, have attempted, in effect, to smuggle in substantive review of agency decisionmaking through stringent procedural review of the environmental impact assessment process. Whatever substantive effect an environmental impact assessment has on agency decisionmaking derives mostly from the desire to avoid prolonged procedural and judicial battles with those opposing a project. But the improbability of international judicial review of the procedural sufficiency of a state's environmental assessment dilutes the substantive impact of the duty.

Some commentators have asserted that environmental impact assessments at least have the salutary effect of mobilizing political opposition to the environmentally hazardous projects. It remains unclear whether the obligation to assess will increase the political costs of undertaking a particular venture. If an environmental assessment really can trigger international resistance to a proposed enterprise, the source state will likely minimize in its report the magnitude and risk of harm that such activity may truly threaten. The requirement of prior assessment thus creates a perverse incentive for states to whitewash environmental dangers in their assessments and even risks frustrating political campaigns. If anything, the mobilization of political opposition to a proposed project will emerge in spite of, not because of, the international obligation to provide a prior assessment.

Indeed, the emergence of the international duty to assess heralds a misguided doctrinal emphasis on placing procedural obligations on states, because states may effectively ratify environmentally hazardous behavior through formal compliance with the duty to assess extraterritorial environmental effects. Without any enforcement mechanism, the environmental assessment program remains a procedural formality bereft of any substantive impact on national decisionmaking.

2. Duty to Inform or Disclose.--States are also deemed to have the duty to inform other states of activities posing a risk of environmental harm. The Lac Lanoux arbitral tribunal stated in dicta that France was required under the Treaty of Bayonne to give Spain notice of the proposed construction of a dam. Although the tribunal never addressed the issue whether the duty to inform would have applied without the Treaty of Bayonne, international legal scholars have exhibited little hesitation--based on an overwhelming consensus of numerous treaties, charters, and resolutions--in proclaiming that as a rule of customary international law, a duty to inform applies to states when planned activity attributable to them carries a risk of significant transfrontier environmental harm.

Notwithstanding the plethora of evidence, the duty to inform lays questionable claim to the status of international custom. At the 1972 Stockholm Conference, a proposed draft for Principle 20 included language
This Draft Principle was jettisoned, however, in part because developing nations, particularly Brazil, expressed concern about the possible hindrances that a duty to inform would pose to Third World economic development and because some states insisted on the sovereign right to determine the kind of information they wished to transmit. Thus, the notion of a customary duty of prior disclosure enjoys only dubious status.

By codifying the duty to inform, publicists risk depriving the norms they posit of the necessary correspondence with states' real aspirations. Because states perceive a specific obligation of prior disclosure as contrary to their interests, the duty is abstracted to such a level of generality that states may plausibly construe a wide range of conduct to satisfy the obligation. Indeed, many agreements fail to specify even a standard for timeliness. Charters and resolutions, moreover, typically enunciate vague requirements of "relevant and available information," "appropriate information," or, quite simply, "information." No universally accepted standards have emerged for determining whether information is "relevant" or "available." Nor do treaties shed much light on the threshold degree of harm or risk of harm needed to trigger the duty. Like the sic utere principle, the duty to inform is an empty abstraction voicing high hopes.

The underlying rationale for the duty to inform rests on unproven and highly contestable assumptions. One scholar insists that a duty to provide information will allow a potentially affected state "to protect itself and to assert its interest in enjoying an unharmed environment." Another asserts that the duty is "obviously" designed to minimize harm to affected states and hypothesizes that, had the United States known about the sloppy training and plant design at the Union Carbide plant in Bhopal, India, "notification of those dangers to India would have permitted India to take remedial action and might have averted the disaster entirely." But even if one were to attribute Union Carbide's conduct to the United States, the 1984 Bhopal incident illustrates the futility of imposing a duty to inform: a lumbering state bureaucracy will often be unable to mobilize itself to respond to the information provided. India was in a much better position to learn of the dangers than the United States, and news reports have suggested that India knew of safety lapses at the plant prior to the accident. Even if the United States had informed India of the plant's hazards, it seems doubtful that the Indian government would have roused itself to close the plant or to clear the population from the vicinity.

On a more general level, it remains unclear how the simple provision of information will reduce transboundary environmental harm. After all, the mere duty to supply data does not necessarily entail any obligation to forego activities that pose a large risk to the environment beyond national jurisdiction. The absence of any liability standards or cause of action prior to the infliction of harm makes it difficult to envision how prior notice will enable a state to assert its legally protected interest to an unspoiled environment.

In spite of these difficulties, commentators are nearly unanimous in their praise of the duty to inform. At first blush, the duty upon states to supply information seems beyond reproach, and the drawbacks outlined above may portray it as at worst innocuously ineffective. Yet the duty to inform may undermine the goal of environmental protection, particularly as it is codified in treaties and declarations. First, careless drafting of a duty to inform provision may allow states to claim that they have performed their responsibility of avoiding transboundary harm simply by supplying information to the affected states. Indeed, the Mexican representative to the 1972 Stockholm Conference opposed Draft Principle 20 on the grounds that it could be interpreted to mean that "the responsibility to ensure protection of the environment, embodied in [P]rinciples 21 and 22, could be met by merely informing neighbouring countries." Second, the vagueness of the type of data that states have a duty to supply risks permitting states to fulfill their obligations by furnishing incomplete or inadequate information. The national security exception, the uncertainty of the standards of disclosure, and the general reluctance of states to disclose information suggest that the duty to inform will tend to be construed in favor of the source state. Thus, a state will be able to vindicate its behavior as satisfying international obligations even as it flouts the spirit of its duties. Third, assuming arguento that the duty to inform may serve as a trip wire setting off international resistance to a major project, the indeterminacies of duty to inform provisions will allow states to claim that their late provision of incomplete information fulfilled international duties. The duty to inform is tailor-made to allow states to clothe environmentally dangerous acts in the legitimizing raiment of international law.

D. Alternative Approaches

1. Equal Access and Remedies Under Domestic Law

The jurisdictional reality of nation-states has long clashed with a planetary ecology "not arranged in national compartments." This Article will address one consequence of that incongruity: the ongoing legal problems created...
by transboundary water and air pollution affecting the United States and Canada. The Article will argue that the expansion of transboundary legal access for remedying transboundary environmental harms may be the most effective possible answer to the problem of transboundary pollution. The Article will urge ratification of the proposed Draft Treaty on a Regime of Equal Access and Remedy in Cases of Transfrontier Pollution,99 drawn up by a joint working group of the American Bar Association and the Canadian Bar Association and recommended to the respective national governments by vote of the two organizations in 1979.

While international law is hampered by the problem of enforcement against sovereigns, domestic judicial systems have substantial enforcement capabilities. The inherent weakness of international law leads to the suggestion of at least one possible answer: domestic courts can, by treaty, provide adjudication for transboundary disputes, and provide also the means to enforce their decisions. The solution to the transborder environmental problems presently facing the nations of the world may thus reside not in the creation of new international institutions so much as in a broadening of the access afforded to existing domestic court systems.


Perhaps the most comprehensive approach to North American transboundary pollution problems was the Draft Treaty written by a joint working group of the American and Canadian Bar Associations. While both bar associations adopted resolutions urging the two nations to negotiate and adopt the documents, neither nation has done so.

Article 2 is the core of the Treaty. It provides a remedy to actual or potential victims of transboundary pollution in the courts of the polluter's residence if a victim residing within the country of origin would have had a remedy for that same pollution harm. Article 2, subsection (a) states:

The Country of origin shall ensure that any natural or legal person resident in the exposed Country, who has suffered transfrontier pollution damage or is exposed to a risk of transfrontier pollution, shall at least receive equivalent treatment to that afforded in the Country of origin, in cases of domestic pollution or the risk thereof and in comparable circumstances, to persons of equivalent condition or status resident in the Country of origin. This wording was intended to ensure equal access to remedies in state and provincial courts as well as in federal courts. Subsection (b) provides that such equal treatment “shall include but shall not be limited to the right to take part in, or have resort to, all administrative and judicial procedures existing within the country of origin . . . .” The comment accompanying article 2 notes that the language is broad enough to include access to proceedings for executing a judgment and for injunctive relief. Quasi-judicial administrative remedies are also thus included, the working group explained, because “[i]n the long run, the right to prevent harmful activity, through participation in such proceedings as administrative hearings on construction permits, is probably a more important power than the right to after-the-fact recourse.”

Article 3 provides equal access and remedy to environmental organizations and other legal persons. In situations where the domestic law of each country permits “environmental defense associations” from within its territory to participate in or initiate both state and national-level proceedings to safeguard “general environmental interests,” similar entities located within the other nation would be granted the “same rights for comparable matters.” This grant of rights is especially important for the avoidance of international disputes, since it allows private parties to address pollution problems characterized by subtle or long-term effects which are often ignored by national governments until the problem has become a major public issue. Article 3 also provides that where some of the formal conditions required for court access in the country of origin cannot reasonably be imposed on persons within the exposed country, these persons should be entitled to start proceedings in the country of origin “if they satisfy comparable conditions.”

The notice provision, article 4, requires the country of origin to provide persons “exposed to a significant risk of transfrontier pollution with notice sufficient . . . to enable them to exercise in a timely manner the rights” created by the Draft Treaty. Article 4 also empowers each nation to designate an authority to receive and disseminate such notice.

Article 5 defines the limits of the legal rights conferred by prohibiting any construction of the Treaty granting “any greater rights” to persons in the exposed country than would be available to persons resident in the country of origin.

As the working group stated in its Report to the Executive, the Draft Treaty is not a new legal system, but an “adjustment of the two countries' existing municipal legal systems.” The Draft Treaty, by enabling equal access and remedy, was designed to be “strictly procedural” and has “no effect whatever on substantive rights or remedies in either country.” However, even a procedural effect ensuring equal treatment to victims of transboundary pollution would be significant.

The Draft Treaty, though simple in outline and brief in length, addressed a number of thorny legal problems.
In particular, it attempted to resolve jurisdictional, standing and choice of law questions.

(1) Jurisdiction

The most basic requirement in transboundary litigation is the jurisdictional authority of the particular court to hear the claim before it. Differences between U.S. and Canadian rules pertaining to territorial jurisdiction emphasize the need for a uniform transboundary procedural system.

In claims involving a local defendant who causes a transboundary harm, U.S. and Canadian courts follow different forms of the local action rule. This rule provides that an action in tort for damage to real property must be brought where the property is located, on the theory that an investigation of title may be necessary. U.S. courts take a liberal approach, applying the rule only in actions involving "title or right to possession of foreign land." In the first international case involving the rule, Armendia v. Stillman, obstructions on the Texas side of a stream caused flooding that damaged property in Mexico. Although the parties were American citizens, the Texas court awarded damages because harm to the property, rather than title, was at issue.

Canadian courts follow a stricter interpretation of the local action rule and exclude "all types of trespass to foreign land . . . as well as actions in nuisance, negligence, or the form of strict liability imposed by the rule in Rylands v. Fletcher." By restricting access to the courts, this application of the rule sometimes frustrates meritorious claims. Several provinces have therefore enacted transboundary claims legislation. Ontario’s Transboundary Pollution Reciprocal Access Act, for example, provides transboundary plaintiffs from reciprocating jurisdictions with access to Ontario courts. Manitoba and Prince Edward Island have enacted similar statutes.

In claims involving a transboundary defendant who causes a local harm, U.S. courts also employ a more liberal jurisdictional test than their Canadian counterparts. The rule in Canada is that to bring an action for a transboundary tort, the wrong must be actionable both where the harm occurred and in the forum jurisdiction. The U.S. rule is simply that the court may impose liability on anyone, regardless of residency or citizenship, "for conduct outside its borders that has consequences within its borders which the state reprehends."

The 1979 Draft Treaty, by requiring equal treatment for all plaintiff nationals, would abolish those inequalities.

(2) Choice of Law

Choice of law questions address what substantive laws apply in a transboundary case. It is a problem that the Draft Treaty addresses through its requirement of equality of treatment among plaintiffs.

The traditional U.S. choice of law approach in tort cases applies the law of the location of the wrong (lex loci delicti commissi) to determine the substantive rights and liabilities of the parties. Procedural issues, on the other hand, are governed by the law of the state where the suit was brought (the lex fori). This formula, however, leaves unanswered the question whether the place of the wrong is the place where the wrongful act was committed, or the place where the resulting injury occurred. One of the Draft Treaty’s greatest contributions is that it would conclusively answer the choice of law question. The Draft Treaty would require that a suit brought by a non-national plaintiff be decided under the laws of the forum state. This would be the case no matter on which side of the border the case was heard or on which side of the border the pollution arose. The Draft Treaty states that it should not be construed as granting "any greater rights to persons resident or incorporated in the exposed Country than those enjoyed by persons of equivalent condition or status resident or incorporated in the Country of origin." It also requires that the transborder plaintiff "shall at least receive equivalent treatment to that afforded in the Country of origin." The reviewing court would thus be constrained to provide no more and no fewer rights than it would afford a plaintiff of its own nation. To provide a transboundary plaintiff with rights equal to those enjoyed by the nationals of its jurisdiction, the court would have no choice but to apply the law of the forum.

Therefore, adopting the Draft Treaty would reduce uncertainty caused by the availability of two similar but different national choice of law rules. Problems inherent in choice of law rules would not be entirely eliminated, of course, but at least the plaintiff—and the court—would know which of the two competing bodies of choice of law rules should be applied. Cases heard in Canadian courts would apply Canadian choice of law rules, while cases heard in American courts would apply American choice of law rules.

Greater certainty in choice of law issues allows plaintiffs to better predict their chance of success in litigation. Potential confusion in the courts would be reduced because the Draft Treaty would allow judges to employ the law they know best, that of their own country. It would also remove the incentive for courts to employ circuitous logic in an attempt to avoid applying one state’s rule of law in favor of another.

b. Fostering the Growth of the Private North American Transboundary Environmental Plaintiff

Of the various approaches to addressing the problem of transboundary pollution, only court-based routes offer routine and non-politicized access to the decisional and enforcement mechanisms essential to any legal regime. However, these routes of access involve myriad procedural difficulties and are seldom utilized. Worse still,
transnational environmental law made without the kind of guidelines the Draft Treaty provides would likely be subject to numerous decisional splits in different jurisdictions. Operating without a unitary approach, the courts of each nation's judicial system would inevitably produce contradictory results. The addition of the Draft Treaty would not assure consistency between U.S. and Canadian court decisions, since the two countries have different substantive environmental statutes. However, it would at least ensure a high level of consistency within each nation's local and federal courts. Similarly, while the Treaty would not change the fact that two different national Supreme Courts would be giving final shape to the environmental laws of each nation, the Treaty would provide a single standard of equal access and remedy to which each high court could hold the lower courts subject to its authority.

The goal in implementing the 1979 Draft Treaty would be to reduce the problem of transboundary jurisdiction until it is no more of a stumbling block than venue, for example, is today. Transborder causes of action will be as much a part of everyday legal reality as transboundary pollution has become a part of everyday environmental reality. Moreover, unlike other approaches to combating transborder environmental harms, the transboundary plaintiff requires no authority fundamentally inconsistent with the sovereignty of individual nations.

More than a potent device for combating transboundary pollution, the Treaty would allow American and Canadian lawmakers to avoid the legal obstacle impeding progress on most international environmental problems: the absolute sovereignty of individual nations. The Treaty would not require the creation of any authority inconsistent with the existing states. This aspect of the Treaty gives it significance outside the context of U.S.-Canadian relations. In the words of the Joint Working Group that drafted the Treaty, its implementation would "not only constitute an important improvement in the handling of disputes between the two countries but also might serve as a model for other countries and regions."

2. Free Market Mechanisms

Free trade agreements sometimes can act as surrogates for traditional international regulation. Recently scientific understanding and public awareness of transboundary pollution have provided the impetus for multilateral agreements designed to curtail transboundary pollution. Among the major air pollution agreements are the Convention on Long-Range Transboundary Air Pollution, the Sulphur Emissions Protocol, the Nitrogen Oxides Emissions Protocol, the Vienna Convention for the Protection of the Ozone Layer, and the Montreal Protocol. These agreements represent an "internationalization" of environmental regulation modeled after conventional international accords. Because the parties to international accords are sovereign states, each party must generate sufficient domestic political support to enact an international regulatory accord. As Robert Hahn and Kenneth Richards have stated, "Domestic politics plays a substantial, and perhaps dominant, role" in the forming of international environmental agreements. Domestic politics, then, is pivotal in achieving multilateral accord.

What happens when the specter of domestic politics acts as a barrier to multilateral accord on regulation of a serious transboundary pollution problem? Are there no alternatives to the format of traditional international law? This Article proposes that, in the absence of requisite domestic political consensus, market forces—through the auspices of free trade agreements—may be employed as a substitute for traditional international regulation. This Article proposes that Hardin's "commons" may occasionally be saved from "tragedy" by applying a variant of Coase's theorem: in the absence of "hard Law," the bargaining of private parties in free trade arenas may result in a curtailment of transboundary pollution.

The Montreal Protocol, for example, is widely acclaimed as a prototypical mechanism for the regulation of transboundary pollution. Fortuitous circumstances, however, surrounded its formation, thus generating the domestic consensus required for its ratification. Its applicability to other transboundary pollution problems, therefore, will be limited to those situations in which a similar political consensus is available.

The United States-Canada Free Trade Agreement (FTA) by contrast, assiduously avoided the issue of transboundary acid rain in spite of the fact that the issue was a vital component of the negotiations preceding ratification of the Agreement. Nevertheless, by providing a free trade arena for the sale of Canadian hydroelectricity to United States markets, the FTA will act as a catalyst for acceleration of these sales. To the extent that Canadian hydroelectricity displaces existing United States energy-producing facilities that are major contributors to acid rain, the FTA will ameliorate the transboundary acid rain problem. Thus, a free trade agreement can be an important mechanism for encouraging environmentally benign behavior through the auspices of the marketplace, where political forces make a hard law regulatory approach infeasible.

The problem of the transmission of acid rain pollutants from the United States to Canada illustrates the dilemma over management of resources held in common that Hardin characterized as the "Tragedy of the Commons." Hardin explained how "common-property" resource degradation occurs, by employing a hypothetical involving herdsmen and an open pasture. As each herdsman pursued his self-interest by increasing the size of his
own herd, the carrying capacity of the pasture was finally exceeded and the pasture--the commons--was destroyed by over-grazing. As Hardin pointed out, where the problem is one of pollution, the situation is somewhat reversed.

In the case of transboundary acid rain, for example, Midwest utilities and industries that burn fossil fuels (and in particular, high sulphur coal) were faced with the necessity of complying with the United States Clean Air Act. Rather than investing in expensive pollution-abating technologies, they found it to be in their best interests (cheaper and, therefore, more profitable) to construct tall stacks that propelled emissions into the atmosphere, where they were carried away from the immediate vicinity and--thereby--avoided detection by governmental monitors.

The result, acid rain in southeastern Canada and the northeastern United States, was thus a problem of 
``externalities.'' Like the herdsman whose additional cattle are a `"positive component" to his profit but a `"negative component" to the commons of the pasture, the tall stacks had the profitable effect (positive component) of permitting the Midwest facilities to export the expense-inducing emissions to the commons of the atmosphere, and thence, to the ecosystems upon which they eventually fell (the negative component).

Hardin averred that, as to the commons of air and water (where privatization is impossible), the only effective devices for protecting them from this degradation are coercive laws or taxing techniques that `"make it cheaper for the polluter to treat his pollutants than to discharge them untreated." As Hahn and Richards have pointed out, domestic laws alone have been inadequate to deal with transboundary pollution and the degradation of the global commons. This inadequacy has inspired the `"internationalization" of environmental laws. However, some analysts have argued that privatization and governmental regulation are not the only effective techniques for averting commons degradation.

One proposed alternative is that of communality, where the users of the commons employ self-regulating techniques. As advocates of this approach have indicated, communality works when historical and cultural perceptions encourage resource management of a commons through social pressure and a spirit of cooperation.

Another approach that has been espoused is inspired by the insights of Ronald Coase. Coase argued that legal imposition of compensatory liability on the polluter was not the most efficacious solution to the problem. Rather, he said, in the absence of high transaction costs (the costs entailed in consummating a business transaction), the preferred, most efficient solution is to permit the offending and offended private parties to reach a mutually satisfactory bargain about the allocation of cost and resource use.

Which solution best fits the problem of transboundary acid rain between Canada and the United States? For purposes of this analysis it will be assumed that each of the approaches identified above can make a significant contribution given the proper context. This writer believes that ideological or normative stances on any side of the issue are counter-productive and can lead to the anomaly that Ida Hoos characterized as the situation of a drunk looking for his wallet under a street light, not because he lost it there, but because the light made his search easier there. Looking under each street light, or policy position, identified above, then, we can see first that Hardin's coercive law approach has been inapplicable. Unlike the ozone depletion problem that eventually resulted in the command-and-control regulatory regime for the Montreal Protocol, the United States-Canada acid rain problem has not yet proved amendable to a regulatory solution.

The acid rain problem has lacked the requisite United States domestic political support that is pivotal in reaching agreement on bilateral regulation. More to the point, the Midwest coal lobby has proved to have sufficient power or clout to preclude a bilateral agreement. In any case, lacking peculiar circumstances that marshaled sufficient domestic support for the Montreal Protocol, the acid rain problem has not been amenable to a bilateral regulatory solution.

Similarly, a communality approach to the problem is not available. As indicated above, that solution requires sufficient cultural and historical bases that give rise to shared perceptions and values about the benefits that accrue to all by protection of the commons. Without these, the leverage of social pressure is unavailable. If transboundary environmental law is in its infancy, then a spirit of transboundary communality or communitarianism must surely be in its nascency. Until that spirit has reached a higher level of development, communitarian extortions like Principle 21 and the Memorandum of Intent, without hard law to give them substance, will exert only minimal pressure, at best, on societal behavior.

Coase's Theorem offers another approach. As we have seen, the United States-Canada Free Trade Agreement avoided the acid rain problem entirely. However, by improving the predictability and stability of bilateral trade in hydroelectricity, the FTA encourages increased trade in that energy source. Because hydroelectricity is inherently cheaper than fossil fuel alternatives and because the price differential favoring hydroelectricity can be predicted to increase as United States Clean Air amendments ratchet down emission limits, it can be anticipated that Canadian hydroelectricity will, to some extent, displace energy generated by United States facilities whose emissions contribute to acid rain. Thus, abatement of the acid rain problem, which eluded resolution during the FTA
negotiations, will be achieved partially under its auspices through the bargaining of private parties. This variant of Coase's Theorem, the use of a free trade agreement, can be seen as a technique to facilitate curtailment of transboundary pollution.

The United States-Canada FTA offers the most obvious case for using transboundary market mechanisms as a "bribe" to discourage behavior that creates transboundary pollution. The two countries are contiguous, and Canada has an abundant energy resource with which to bribe the United States market. Nevertheless, the applicability of transboundary market mechanisms is not limited to the United States/Canada situation. Any resource, not necessarily an energy resource, that, when marketed in the polluting country, undercuts the price of products or industries that are environmentally more destructive will induce pollution abatement. The trick is simply to make activities that generate the offending pollutants more expensive than relatively benign alternatives that are made available through bilateral markets. Trade agreements can encourage this phenomenon by a judicious and selective elimination of trade barriers.

Just as the latter half of the twentieth century has witnessed a distinct trend toward bilateral and multilateral environmental law, it has also been witness to the proliferation of free trade agreements between nations. When the option of a hard law regulatory system is foreclosed, a free trade agreement like the FTA occasionally may act as an effective alternative to a regulatory approach by facilitating environmentally benign behavior through the operation of the marketplace.

FOOTNOTES CHAPTER 8


5 *Lauterpacht, The Function of Law in the International Community* 298 (1933).


7 For a distinction between primary, material, or substantive rules of international law, and secondary or functional rules (those of state responsibility proper "intended to promote the practical realization of the substance of international law contained in the primary rules"), see Tammes, [1969] 1 ILC Y.B. 109, para. 5.

8 Conditions for the existence of an internationally wrongful act.

An internationally wrongful act exists where:

(a) Conduct consisting of an action or omission is imputed to a State under international law; and

(b) Such conduct, in itself or as a direct or indirect cause of an external event, constitutes a failure to carry out an international obligation of a State.


9 3 UN R.I.A.A. 1905.

10 12 UN R.I.A.A. 281.


14 Thus in the Corfu Channel case, for example, the IJC stated as a principle of international law of general applicability, `every State's obligation not to allow knowingly its territory to be used contrary to the rights of others.' 1949 I.C.J. Rep. 4, at 22. *See* further Principle 21 of the Stockholm Declaration, Report of the Stockholm Conference, U.N. Doc. A/CONF.4 8/14., at 7, reprinted in 11 I.L.M. 1416, 1420 (1972), which commits states `to insure that activities within their jurisdiction or control do not cause damage to areas beyond the limits of national jurisdiction'; and the decision in the Trail Smelter case, 3 U.N. RIAA 1095, at 1965.

15 Reference here is to the approach charted by the late Prof. Quentin-Baxter, the ILC's first special rapporteur, to the topic of `international liability for injurious consequences arising out of acts not prohibited by international law'
law.' Not surprisingly, he embraces the principle of equitable utilization, or the `rules of sharing' in relation to internationally competing uses of natural resources, as a fundamental order principle by which states' entitlements are routinely settled. See Quentin-Baxter, THIRD REPORT ON INTERNATIONAL LIABILITY FOR INJURIOUS CONSEQUENCES ARISING OUT OF ACTS NOT PROHIBITED BY INTERNATIONAL LAW, SCHEMATIC OUTLINE, §§ 5-6, U.N. Doc. A/CN. 4/360, at 23, 27-29 (1982).

16 See, e.g., Calabresi, About Law and Economics: A Letter To Ronald Dworkin, 8 HOUSTON L. REV. 553 (1980); and Dworkin, Why Efficiency?, id. at 563.

17 Thus Principle 12 of the Declaration stipulates: `Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.'


23 Risk is a function of frequency (events per unit of time) and magnitude (consequences per event). U.S. NUC. REG. COMM'N, REACTOR SAFETY STUDY: AN ASSESSMENT OF ACCIDENT RISKS IN U.S. COMMERCIAL NUCLEAR POWER PLANTS, WASH-1400 (NUREG 75/014), at 9 (1975).

24 As to the relevance of such a distinction, see, e.g., the dissenting opinion of Judge Wright in Ethyl Corp. v. EPA, 7 ERC 1353, 1386-87 (D.C. Cir. 1976); and his majority opinion in Ethyl Corp. v. EPA, 541 F.2d 1, 18, 8 ERC 1785 (D.C. Cir. 1976).

25 In other words, some insignificant transnational environmental effects of a proposed state activity are an accepted fact of the physical co-existence of political entities and their interdependence in a world of shared natural resources.

26 This theme underlies the classic negligence definitions of Judge L. Hand in United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947), and of Terry, Negligence, 29 HARV. L. REV. 40 (1915-16). Two recent decisions by United States courts, Reserve Mining Co. v. EPA, 514 F.2d 492, 7 ERC 1619 (8th Cir. 1975), and Ethyl Corp. v. EPA, 541 F.2d 1, 8 ERC 1785, (D.C. Cir. 1976) might also be mentioned.

27 In a minority opinion of the ICJ in the Nuclear Tests cases, such a denial was found to result from the deposit of nuclear fallout in another state's territory and was referred to as a `violation of so-called `decisional sovereignty.'" [1974] I.C.J. 253, 369 (joint dissenting opinion).

28 Cf. The related issue of the safety assessment of consumer goods and the recent outcry over the proposed

38 See Island of Palmas Case (Netherlands v. United States), 2 R. INTL ARB. AWARDS 830, 838 (1928).

40 The United States Restatement of Torts lists parameters for such a classification. Other legal systems, although they may formally provide only very general guidelines, resort to the same types of parameters. See, e.g., THE LAW COMMISSION, CIVIL LIABILITY FOR DANGEROUS THINGS AND ACTIVITIES, paras. 13-16 (1970); Lord Porter in Read v. Lyons and Co., Ltd., [1947] A. C. 156 (both involving hazardous activities under English law).

41 The relevance of parameters for determining the allocation of social costs of a given hazardous activity to the process of determining its permissibility is obvious. This process can, of course, result in opposite outcomes; in one case the benefits may be held to outweigh the costs, making the carrying on of the activity lawful under certain conditions, e.g., acceptance of liability by the actor irrespective of fault, while in another case the overall cost/benefit balance may tip towards the cost side, causing the activity to be held impermissible.


49 Trail Smelter Award (U.S. v. Can.), 3 R. INTL ARB. AWARDS 1905 (1938 & 1941).


53 The *sic utere* maxim ``is mere verbiage. A party may damage the property of another where the law permits; and he may not where the law prohibits: so that the maxim can never be applied till the law is ascertained; and, when it is, the maxim is superfluous." Rose v. Socony Vacuum Corp., 54 R.I. 411, 416, 173 A. 627, 629 (1934).


56 See United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947) (weighing the probability and severity of a harm against the burden of preventing the harm).

57 Even Judge Learned Hand, author of the *Carroll Towing* opinion, acknowledged that the difficulties in employing his algebraic formula for negligence ``arise from the necessity of applying a quantitative test to an incommensurable subject-matter." Moisan v. Loftus, 178 F.2d 148, 149 (2d Cir. 1949).

58 For example, the WCED, a United Nations organization, proposes strict liability as a legal principle for transfrontier pollution.


Thus a river, as viewed as a stream, is the property of the people through whose territory it flows, or of the ruler under whose sway that people is. It is permissible for the people or the king to run a pier out into it, and to them all things produced in the river belong." 2 Grotius, *De Jure Belli ac Pacis*, Ch. 2, sec. 12 (1646 ed., Kelsey trans.).

"But the same river, viewed as running water, has remained common property, so that one may drink or draw water from it." *Ibid*.


LABROUSSE, *DES SERVITUDES EN DROIT INTERNATIONAL PUBLIC* 13-14 (1911).

"Lake Lanoux (Spain v. France)," 62 Rev. Gen. de Droit Int. Pub. 79 (1958); *see* 53 AJIL 156 (1959), for translation. The case, which was decided Nov. 16, 1957, has been carefully analyzed by Gervais, "L'Affaire du Lac Lanoux," 6 Annuaire Francais de Droit Int. 372 (1960). *See also* J.G. Laylin and R.L. Bianchi, in 53 AJIL 30 (1959).


Corfu Channel Case (Merits), [1949] ICI Rep. 3.


83 *See*, e.g., A. LEVIN, *PROTECTING THE HUMAN ENVIRONMENT X* (1977).

84 "[L]iability is insufficient to ensure the protection of the environment . . . . The damage that [the environment] suffers is often definitive, the deterioration irreversible . . . . or then the cost of restoration is extraordinarily high . . . . For all of these reasons, an intervention a posteriori whose outcome frequently remains in doubt . . . cannot be considered an efficient remedy." A. KISS, *DROIT INTERNATIONAL DE LOENVIRONNEMENT* 81, 131 (1989) (author's translation).


86 *See*, e.g., Kiss, *Le controle d'activites prejudiciables a l'environnement par des regimes d'autorization prealable, ou de declaration*, in *TRENDS IN ENVIRONMENTAL POLICY AND LAW* 81, 81-82 (M. Bothe ed. 1980); Sand, *International Cooperation: The Environmental Experience*, in *PRESERVING THE GLOBAL ENVIRONMENT* 274 (J. Mathews, ed. 1991). One scholar asserts that "awareness and consideration of [detrimental] effects at the planning stage . . . will obviously result in sound planning and . . . avoidance of


93 See Lac Lanoux (Spain v. Fr.), 12 R. INT'L ARB. AWARDS 281, 314 (1956).


