



LEGAL AND INSTITUTIONAL RESPONSES TO GROWING WATER DEMAND

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

LEGAL AND INSTITUTIONAL RESPONSES TO
GROWING WATER DEMAND

prepared by

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for the

LEGISLATION BRANCH, LEGAL OFFICE

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FOREWORD

In addition to the growing number of comparative studies on water law and administration published so far by the United Nations Secretariat and by FAO, two important international conferences were convened in 1975 and 1976 to review past experiences and world-wide trends in this field! a Conference on Global Water Law Systems was held in Valencia (Spain) under the sponsorship of the Spanish Government and of various American academic and research institutions, in cooperation with the International Association for Water Law and the International Law Association, and with the participation of the United Nations Secretariat; the 2nd International Conference on Water Law and Administration (AIDA II) was held in Caracas (Venezuela) by the International Association for Water Law, in cooperation with the Venezuelan Government and with the participation of the United Nations Secretariat and FAO; this Conference was considered as one of the preparatory meetings for the 1977 United Nations Water Conference.

As part of its contribution to the United Nations Water Conference, FAO submitted a background paper entitled "Water for Agriculture" (Doc. E/CONF.70/11) which reviews the technical, economic and social aspects of water in agriculture and proposes an Action Programme for increasing food production.

In order to complement this review, and taking advantage of the comprehensive and up-to-date compendium of data made available by these two international water law conferences, it was considered useful to produce an independent study presenting a synthesis of recent legal and institutional trends in a factual and action-oriented form.

Professor Ludwik Teclaff, a well-known water resources and environment law specialist, currently teaching at the Fordham University Law School (New York), was asked to undertake this survey which the Legislation Branch is pleased to publish as one of its Legislative Studies.

Dante A. Caponera
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INTRODUCTION

It is hardly too much to say that the availability of, water has become a crucial factor in the preservation of our present civilization. Yet the pressure on existing water supply and the projected future demand are such that our ability to cope with the situation, given all the sophistication of modern science and technology, is far from assured. This results from four main factors and the interactions between them: exponential population growth, demand for food, rapid urbanization, and spreading industrialization. In the fifteen years from 1960 to 1975, world population rose by one-third, from some 3,000 million to around 4,000 million, and five-sixths of this increase was in the less developed regions. As a result of their faster growth, the less developed regions comprised 71.6 per cent of total population in 1975, as opposed to 67.4 per cent in 1960 1/. Population growth is the major determinant of the demand for food, and here two contrasting tendencies are in operation. Food production is growing much faster than population in the developed countries, but much more slowly than population in the developing countries. It is estimated that food demand in developed countries is rising at an annual growth rate of 1.5 per cent, in the developing countries at a rate of 3.6 per cent a year. Yet at present it is believed that not more than one-eighth of the arable land in the developing countries is commanded by irrigation, and the greater part of this is in the Far East 2/: The prognostics of this situation were an item of major concern at the World Food Conference in Rome in 1974:

"...(In) the longer run, and certainly after 1985, it will not be possible to feed the population of the developing world unless, in addition to every possible yield improvement, large new areas of land and substantial new flows of water are mobilized for agricultural production." 3/

As far as water supply is concerned, however, the problem is compounded by the rapid rate of urbanization within recent years, and there is no reason to assume that it will not continue. Between 1970 and 1975, an estimated 106 million persons in the world transferred from rural to urban places, 33 million in the more developed regions and 73 million in the developing countries. The overall level of urbanization is more than 60 per cent everywhere except in South and East Asia and Africa. Much of the rural-urban transfer is to metropolises. More than a fifth of the total population in the developed countries and nearly a tenth of that in the developing countries now lives in million cities. A most significant element in this process is the change in size and number of million cities in the less developed regions: between 1960 and 1975, they more than doubled, from 45 to 101, and the percentage of total population of the regions living in them nearly doubled, from 4.9 to 9.2 per cent 4/.

Add to this the spread of industry, especially the power industry, which is a very large user of water for cooling purposes. Rising industrialization tends to concentrate in and around urban areas and not only accounts for a major share of urban water demand, but also contributes to the shrinkage of existing water supply through pollution. The urban and industrial centres, old and new, swallow up much-needed agricultural land and compete directly with the food-producing sector of the economy for available water. Moreover, since many of the world's larger cities occupy river estuary and coastal sites, their polluting activities endanger what is, perhaps, potentially the richest of all food producing areas - the estuarine zone of aquatic life.

This immense and rapidly growing demand for water must be met from limited and unevenly distributed supplies. The global water balance by continents and countries is now fairly well known and contains few uncharted areas or unsuspected potentialities. There are still some relatively unused conventional sources in certain areas; groundwater is the largest of these (but nearly 50 per cent of the world's groundwater lies at depths of more than half a mile). Technology holds out the promise of augmenting supplies by desalination, weather modification, snow and ice melt, advanced waste water treatment, and other means, but at escalating cost. Large-scale redistribution of water may be effective in certain circumstances, but the natural constraints of the river basin unit and of the hydrologic cycle itself set limits to this form of manipulation of supply.

The outlook is somber. In some countries, existing water uses have already approached the physical limits of local availability - Israel is one such, and has been operating for some years on a system of what is, in effect, national water rationing. Estimates of community water supply in developing countries with rapid population growth forecast a deteriorating situation. By 1980 it is expected that the percentage of urban dwellers not served by community water supply will have risen from one-third to more than half, or 390 million people. The rural population in these areas will be in even worse plight. Ninety per cent, or 1,300 million, will lack this basic service, and even if the objectives of the Second United Nations Development Decade were fully realized, there would be only slight improvement 5/.

The overall picture, in the developed and the developing countries, is one of shortage and crisis that previously existed mainly in the arid regions of the world. It was the arid regions that historically developed a close community control over the disposition of water, and it would appear that the challenge of future water demand pushes the development of water law and water institutions in that direction.

The ascendancy of the administrative system within the present century has been only a first step in this development. The next step was a continuing drive toward consolidation of the administrative structure, areally and functionally, from management of sectoral uses to management of water as a resource, so as to provide the system with more flexibility needed to cope with changing demand. Organizational consolidation was applied at first to surface waters, because their unity within the drainage basin was more readily perceived and gave an objective basis for unification of administration within the watershed. As the interrelationship between ground and surface waters became recognized, new water codes have extended administrative control over groundwater as well, and the most recent of them encompass atmospheric waters also. Once all waters have been brought into the administrative fold, it remains to devise the most effective means of exploiting them as an indivisible resource, a common pool of interchangeable supplies and interchangeable uses. This, the most recent development in the administrative system and one which holds perhaps the most promise for conserving existing sources of supply and making new sources available, has become known as conjunctive management.

All these structural and functional changes in water administration have added greatly to its powers. Possibly the most significant increase in those powers has come with the growth of planning responsibility, because planning, which is a necessary prerequisite of any efficient management of water resources, may determine the development and allocation of water for generations and its results cannot be undone or even modified readily, if at all. This great increase of power accorded the administration in order to give it sufficient flexibility to meet present and potential water demand has brought in its wake another set of structural and functional developments to assure that administrative decisions be as free from arbitrariness as is possible without jeopardizing efficient water management.

At the level of the individual water user, protection of rights still is best achieved through the traditional medium of users' organizations and by associating users as much as possible in the planning and decision-making process. It is a different matter where the general public interest is concerned, for there are many publics, and water administration does not consider all of them its constituents. It is becoming gradually accepted, though rather in theory than in practice yet, that the most equitable allocation of the costs and benefits of development will be reached if major decisions are based on the consideration of all relevant factors and on a well-documented choice of alternatives, and are open to public scrutiny. Openness and publicity, even if no formal means of challenging a decision is provided, may be the best insurance against abuse of administrative power.

General limitations on arbitrariness in water administration have been formally and informally articulated in some countries in an effort to reconcile development with protection of the public interest in the maintenance, restoration, and enhancement of environmental quality. Environmental concern is not, as is sometimes thought, merely a feeling for amenity or a device for stalling progress. It is a widely recognized and necessary interest in the preservation of vital natural processes which are not yet fully understood and which, if disrupted, may bring about a chain of adverse primary and secondary consequences out of all apparent proportion to the initial scope of activity. Preventing the salinization and waterlogging of an irrigation area is a matter of environmental concern as much as, indeed more than, the preservation of a sport fishery.

This entire spectrum of legal and institutional responses to growing water demand has special relevance for food production. The particular needs of the food producing sector of the economy relate to the supply, quality and timing of water for irrigation, water for stockrearing (which, in many parts of the world, involves the development of groundwater resources), and water for fisheries and aquaculture, in which the preservation of wetlands and estuarine areas plays a vital role. As a recent United Nations survey of global water demand has emphasized: "Irrigation, since it is an inherently consumptive use, may be expected to become the key issue of water resources development on a world-wide level and in a long-range perspective" 6/. Yet a definitive study of the world water outlook for agriculture observed that the obstacles to expansion of food production are not so much environmental and technical as infrastructural:

"Probably the most serious (and yet not uncommon) constraint is that imposed by the absence of a realistic overall policy and plan for water development and use, which precludes the establishment of an effective infrastructure, and prevents the adoption of sound principles for joint land and water planning. The most usual cause of this situation is the dispersion of responsibilities for water among many interested agencies, and the lack of an effective authority or mechanism for coordinating the diverse activities within an appropriate physical or administrative framework such as a river basin or national plan." 7/

In this connection, the 1974 World Food Conference urged governments and international agencies to improve the administration and management of water delivery systems 8/, and a report on the world food situation concluded that successful irrigation development was as much a matter of the institutions developed for operation and administration as of the engineering for construction and design 9/. Thus, the emerging concept of flexibility in legal and institutional response to increased water demand must at the very least encompass the integration of food production into multi-objective water resources planning and administration with due regard for its place in the system of priorities, and it must provide for the resolution of conflicts between the rural and the urban economy in demand for water.

I. TOWARD THE IDEAL OF FLEXIBILITY IN LAW

Ideally, water law should formalize the most efficient methods of synchronizing demand with available water supply. It should be a medium for adjusting technology to social conditions, one which would facilitate, not impede, the distribution of water where it is most needed. Where water is abundant, community needs may be satisfied without much contribution from law and institutions. But when demand for water approaches or exceeds the limits of supply, a smooth operation of law and institutions, bordering on the ideal, becomes imperative. Fulfillment of this imperative is sought at present, sometimes consciously and sometimes not, by increasing the control of the administration over the use of water and, in consequence, its potential for flexible response to water needs -but with built-in safeguards that these powers are used for the common benefit. This is why systems of water law which developed in times past, when the need for flexibility was less, are being replaced or modified.

In customary law, which formed the bulk of all water law until quite recently, and which still applies to many areas of the world, there is very little scope for sudden changes, for the introduction of new techniques, or for the reorganization of water distribution. Ancient Talmudic law, for example, laid down precisely the priority of uses and users at a community spring 10/. Moslem customary law forbids the alteration of an established irrigation system and imposes strict servitudes to receive water and to let it flow 11/. The scarcer water becomes, the more complex and detailed is its pattern of distribution, varying in method even from well to well or wadi to wadi. Under these circumstances, the weight of local community practice has been sufficient in Moslem countries to forestall change 12/. Similarly, in India, the basic organization of water distribution through the village governing body or panchayat has survived undisturbed for centuries through successive changes of government, Hindu, Mogul, and British 13/.

In Europe also the distribution of water was long governed by immemorial usage, expressed in local customs, such as those of France and Poland, which stipulated that water should not be diverted from its natural course, and in the maxim of English law, "aqua currit et debet currere ut currere solebat" 14/. As the principle of ancient use slowly gave way to the riparian rights doctrine, the tenet persisted that the flow of the stream should remain unchanged after satisfying domestic uses. Even where, as in the eastern United States, the riparian doctrine was modified from a natural flow to a reasonable use version in order to accommodate new types of use, it imposed constraints on the scope of these uses 15/. It remained for decades adequate to the needs of areas, such as Britain and the eastern United States, with a normally good water supply and a well-developed judiciary to adjudicate conflicts, but in the western United States its development was forestalled by the rapid spread of the prior appropriation doctrine. In the early settlement of the American West water users literally out-ran the law and the courts and became squatters on public lands. The property-oriented riparian doctrine could not be applied to them, and when, after 1862, most of the region was opened to private land ownership, prior appropriation had taken a strong hold, due to its adaptability both to energetic development and to more arid conditions.

But prior appropriation was only another example of custom (initially mining custom) elevated to a major system of water law. Indeed, some of the courts in the nineteenth century attempted to give it a veneer of great antiquity, by stretching its beginnings -in a legal fiction - back to immemorial times 16/. The early, non-statutory method of perfecting water rights (which was still recognized in some states until a few years

ago) 17/ minimized interference on the part of the administration. Eventually, after the initial features of automatism and self-help were abandoned prior appropriation developed into a permit system, but even then insistence on priority of application imposed severe constraints on flexibility.

Thus, two of the world's major systems of water law achieved a relative freedom from arbitrariness at the expense not only of flexibility, but also of effectiveness in overall use and conservation of the resource. Though the riparian doctrine reflected the interdependence of waters and the unity of the basin by recognizing the community of interests of users, it could protect this community of interests only by limiting the number of persons entitled to the use of water to landowners bordering on the flowing stream, by reducing the possibility of change, and by circumscribing the scope of new uses. In its reasonable use version, it eventually lent itself to grave abuse of the resource through a built-in preference for industrial activity which, being riparian, led to almost unrestricted water pollution 18/. Prior appropriation's shortcomings also became increasingly apparent with the passage of time. It made no provision whatsoever for in-stream, non-consumptive uses of water, since the essence of the system was to put water to beneficial use by diversion, and non-consumptive uses were not, until very recently, considered beneficial. It was, and is, inherently wasteful, despite the proclaimed limitation of the appropriative right to an amount of water which can be beneficially used. The common practice has been to apply for the maximum usable quantity, whether actually needed or not; this has discouraged any attempts to economize, for water conserved is not put to beneficial use and the practice may even result in loss of right. Like other customary water law systems, prior appropriation also relies heavily on prevailing community methods of water use and provides little or no incentive for the introduction of new techniques and better distribution 19/.

The administrative system of water disposition developed in areas of water shortage contemporaneously with ministerio legis systems in areas where water was more abundant. Administrative disposition of some waters goes back at least to Roman times, when an authorization was required for taking water from navigable streams, but its real ascendancy began in the nineteenth century. In France administrative authorizations were required even on non-navigable and non-floatable streams from the time of the Revolution onwards. The law of 1790 charged the administration with the control of waters for the common benefit in accordance with the principles of irrigation, and the Decree of 1852 imposed the necessity of an authorization for taking water by means of machines from non-navigable and non-floatable streams 20/. The 1852 Decree was further elaborated in the water law of 1898, under which only simple cutting in banks for the purpose of irrigation was excepted from administrative control 21/. In Spain, the Decree of 1846 established firmly the necessity of authorization for most uses of water, and this provision was reiterated in subsequent legislation until it came to full flower in the laws of 1866 and 1879 which established the principles of modern Spanish water law and placed most waters in the public domain 22/. During the second half of the nineteenth century permit systems became firmly established in a number of the German states, and the right of riparian owners to use water without authorization was confined in most of Canada and Australia to domestic purposes 23/.

But the nineteenth century administrative disposition also displayed a great deal of rigidity. The Spanish system, for instance, disseminated and perpetuated the concept of permanent concessions which could be revoked only for reasons stated in the law, such as failure to use them and failure to fulfill the conditions under which they were granted 24/. Moreover the administrative system was nowhere all-embracing: it had to co-exist alongside the vestiges of riparianism and private ownership of various waters. French law maintained the privileged position of the riparians right down to 1964 as far as non-navigable and non-floatable streams were concerned 25/. In several of the countries of North Africa, although all watercourses were placed in the public domain soon after they came under French rule, acquired rights of property or usage were maintained and complete regulation

was not achieved for many years, 26/. Riparian rights were preserved long after most waters had been declared public in several South American countries which had borrowed, directly or indirectly, from the French system. (Chile, for example, proclaimed as public in its 1855 Civil Code all rivers and all water that flowed in natural channels, but did not finally abrogate riparianism until almost a century later, in 1951 27/.)

Thus, in the older industrialized and urbanized parts of the world the institutional framework inherited from the nineteenth century was incapable of meeting the demands of metropolitan water supply and modern industry and agriculture, nor could it provide adequate legal and administrative support for technological change and new concepts in planning. It was fragmented; it paid little heed to the interdependence of even surface waters, and groundwater was to a very large extent outside its purview; it perpetuated wasteful practices and water rights not geared to current purpose; and because it was sectorally organized, it failed to harmonize separate and competing uses. In the less developed parts of the world, legislation and administration which had been imposed from without or copied from European models suffered from the inherent defects of the parent systems and were, in addition, often little suited to the physical, social and economic conditions of the societies onto which they had been engrafted.

The modernization of water law began in earnest after World War II under the impact of growing demand for water in all parts of the world. New codes were drawn up in many countries, one of the earliest of this period being the Israeli code of 1959 and one of the latest the Polish code of 1974 28/. To varying degrees these new enactments tried to remedy the deficiencies of the older systems and to embody, on the one hand, ideas for promoting greater efficiency, and, on the other, the harmonization of conflicting and competing interests and demands on limited water resources.

1. Prior Rights

The flexibility in these modern water codes varies. Perhaps the most meaningful indices of the degree of flexibility achieved are: uniformity of the system (that is the extent to which rights acquired under previous legislation are subjected to the new regime); the duration of authorization to use water; and the assignment of priorities of use.

One of the gravest obstacles to effective water administration has always been the persistence of prior rights. In the past such prior rights were left more or less undisturbed, bringing about a complicated situation in which different regimes applied to the same source of water 29/. Even the English Water Resources Act of 1963, which performed drastic surgery on riparianism and transformed it into a permit system, gave users the statutory right to continue their uses, thereby making it more difficult to adapt water management to changing needs (and changing physical conditions, such as the 1976 drought) 30/.

Laws which assimilate pre-existing uses into the new system after a period of grace represent a more general trend in the newer legislation. They give the administration full control eventually, while making the transition less painful for users who may receive less water or be forced to alter their pattern of use under the new regime. For example, under the Israeli law of 1959, the grace period was 90 days for persons who produced or supplied water on the effective date of the law or within one year prior to that date 31/. The 1963 Water Code of La Rioja province, Argentina, required holders of rights under previous laws to apply within one year for new concessions 32/. Under a 1974 law of the State of Arizona, the grace period was longer still: those who claimed an existing water right at the time of the act were required to file a statement of claim by 1977 33/.

The most radical treatment is found in some recent codes which virtually abolish pre-existing uses by making their assimilation into a new permit system mandatory, immediate, and subject to their conformity with new national or regional plans. For example, Poland's Water Law of May 30, 1962, held that rights previously acquired retained their validity only if they were not at variance with general water plans - a matter to be determined by the water administration 34/. Whatever the purpose may be - and it could be rather for land reform, as in the Peruvian Law of 1964 35/, than primarily for better water management - such mandatory integration of all uses into the system gives the administration much more control over water allocation, but lends itself to the arbitrary exercise of power.

2. Duration of Right

Long duration of water rights has been a major obstacle to change, though it undoubtedly gave stability to water use regimes. Permanence of the water right is an important feature of riparianism and prior appropriation. Old-established administrative systems also acquired a certain rigidity over the years through the institution of permanent concessions, which are characteristic of Spain and some Latin American countries 36/, and through the distinction made, as in Spain and Italy 37/ between short-term and long-term utilization of water, whereby concessions for the latter were granted for 60 and 75 years and even longer. By contrast, under the 1950 law of the State of Iowa permits are granted for only ten years 38/: this radical provision represents a swing from one extreme to the other, for under Iowa's former riparianism the right was given in perpetuity and could not be lost by non-use. In some countries, duration of right is left open-ended in newer laws. The Polish Water Law of 1974 simply states that permits are granted for a definite period 39/; in effect, this means that the administration has a considerable degree of latitude.

Truly short-term authorizations (e.g., for twelve months or for a season) have been in operation for many years in some countries 40/. However, they are usually granted for minor diversions, surplus waters, particular crops, or non-consumptive uses. But in Israel, under the 1959 law, the one-year duration of the production license, which is the principal and basic document of the water rights system, applies to all types of consumption and every water purpose without exception 41/. Within this one-year period, the provisions of the production license are re-examined, giving the administration still further control, for, in re-issuing the license, the Water Commissioner may stipulate any conditions deemed necessary to conserve the supply and improve efficiency in its management and use.

The increasing flexibility of legal systems is further shown by provisions which permit the administration to revoke or modify water rights for reasons other than scarcity of water or the fault of the user, i.e., for public purposes or as part of an overall plan. The 1963 Water Resources Act of England and Wales allowed river authorities to formulate proposals for revoking or varying licenses; it was the central administration's responsibility to act upon such proposals 42/. Several modern laws - among them the Polish Water Law of 1974, the Panamanian Law of 1962, and the 1955 Water (Development and Distribution) Law of Cyprus 43/ - permit cancellation or modification for the very broadly expressed purpose of "public interest". In Poland this can also be done if required for the realization of the general plan for the national economy 44/, and in Chile the Land Reform Act of 1967 provided for total or partial extinction of rights when required for economic development of a region 45/, or when the President of the Republic, by supreme decree, established areas in which water use was to be rationalized 46/. Other laws gave the administration latitude to take advantage of technological advances and to modify the entire spectrum of water use rights on the basis of new data inputs. The statutes of Salta and San Luis provinces of Argentina permitted variation and revocation after technical and hydrographical surveys had been carried out 47/. So, also, did the Kenya Water Ordinance of 1952 and, in addition, it provided for cancellation or amendment of a permit

or license whenever a scheme for more efficient storage, distribution and use of water had "been approved 48/. The exercise of such powers by the administration in the name of public interest, economic development, or greater efficiency carries with it the danger of arbitrariness, and sometimes individual and group rights may be abrogated simply to benefit large-scale development projects undertaken by the water administration for another group of users or for political or quasi-political objectives 49/.

3. Priority of Right

Priority of right or use exerts its influence in two instances - when the right to use water is first accorded, and when there is not enough water to satisfy existing uses. Generally, the higher use on the adopted scale is granted before the uses lower down, and within the same category of uses priority of application is often the principal criterion for granting an authorization. In time of shortage, the inferior use may be completely shut off; this happens, in the prior appropriation system, to the junior appropriator, and, under the riparian doctrine, to all other riparian uses when the domestic use of the upper riparian must be satisfied. A rigid hierarchy of uses is a contribution to stability, but an obstacle to change. Some regimes have a long and detailed list of priorities - for example, Texas law contains no fewer than eight categories of use 50/. This may perpetuate claims to preference which are no longer warranted by circumstances! navigation and the provision of water for railroads are two activities which, in many areas, do not rank as high in importance as they once did, but still command priority in law.

Domestic use, which holds first priority in water law universally, is often exempt from permit requirements. Statutes which provide such exemption include the Canada Irrigation Act of 1906, the British Columbia Water Act of 1909, the New South Wales Water Act, 1912-1955, and the South Australia Control of Waters Act, 1919-1925 51/. Another is the New Civil Code of the Philippines, which provides that water can be used freely for domestic purposes, subject to municipal regulation 52/. When Victoria, Australia, formally abandoned riparianism by the 1886 Irrigation Act, it accorded all riparians a statutory right to divert for domestic or "ordinary" uses, instead of merely exempting them 53/. Likewise, the 1963 Water Resources Act of England and Wales permits riparians to abstract without license an unlimited amount of water for domestic purposes at the place where their land is contiguous to inland water 54/.

Domestic use of groundwater is also allowed without permit in many jurisdictions, because it is not considered to deplete the resource. In some common-law countries, even though surface water may be under administrative control, the landowner still retains an unrestricted, or at least generous privilege, to the use of water beneath his land. For example, the South African Water Act of 1956 contains no provisions concerning percolating underground water, except for the specially designated subterranean-water control areas, and even there it permits the landowner unrestricted use as long as he does not dispose of or use the water outside his land 55/. Again, in England and Wales, the occupier of land may use an unlimited amount of underground water for domestic purposes without a license 56/.

In the U.S.S.R. and eastern Europe, despite the nationalization of water resources, the individual extraction of groundwater for domestic purposes has been permitted without special authorization 57/, though some limits have been set on the rate of extraction. Under the Polish Water Law of 1962, for example, it was not permitted to exceed six cubic meters per hour 58/. Similarly, the Iranian Water Nationalization Law of 1968 permits the use of ordinary shallow wells for domestic purposes up to an amount of 25 cubic meters in twenty-four hours without authorization 59/.

It is, of course, important to give adequate recognition in law to the paramountcy of domestic purposes, and important also to bear in mind the difficulty of exercising administrative control over innumerable minor abstractions of water. For the sake of uniformity, however, which is a necessary ingredient of efficiency and flexibility, domestic uses should be subject to the rules of the system. This becomes imperative in municipal supply, when air-conditioning, lawn-watering, car-washing, commercial laundering, and a host of industrial purposes, all of which require large amounts of water and cause considerable waste, are subsumed under the "domestic use" umbrella. Individual cities have got over the difficulty by separating the drinking water supply from that of lesser quality, and some have strictly defined the purposes for which domestic supply may be used 60/, but generally the law has not addressed itself to this problem.

In some instances listing of priorities has been abandoned and public or social interest made the sole criterion of preference. This was done as far back as 1933 in the Italian Testo Unico, and it is a feature of some modern codes which reflect changes in the social structure of a country, such as the 1964 agrarian reform law of Peru 61/. Here, the pendulum may be swinging to the other extreme, and flexibility may be achieved at the price of too much arbitrariness, unless the decision to grant or not grant or to curtail a right is accompanied by an explanatory opinion and is open to review by a tribunal or other impartial body within a reasonable time and at a reasonable cost.

II. CHANGES IN ADMINISTRATIVE STRUCTURE TO PROMOTE EFFECTIVENESS AND FLEXIBILITY

1. Sectoral, or Use-oriented, Administration

Sectoral administration, in which each individual type of water use - agricultural, industrial, power production, or community supply - is entrusted to an existing department of the general administration or to a new department created specifically for it, is the oldest form of administrative intervention and probably still the most prevalent. Such administrative fragmentation often results from a piecemeal approach to legislation. Countries which have many laws on water tend also to create at every level, national, regional and local, a multiplicity of agencies to implement them 62/.

Under this type of administration, a water use that is particularly important for the economy, such as irrigation, will have its own special agency 63/. Irrigation agencies are frequently among the oldest elements in a country's water administration and their importance, already grounded in seniority, expertise, and a long-established user "constituency", may be reconfirmed by subsequent legislation of an enduring character 64/. Conversely, many water Uses and activities are administered by agencies and departments whose primary mandate is not water management per se. Pollution control is an outstanding example. Until very recently it was almost universally the responsibility of health departments 65/. Groundwater extraction, because of the construction involved, has tended to be the responsibility of geological, engineering, and mines departments, but construction activities in surface waters have often been administered by general public works agencies 66/.

Fragmented, purely sectoral administration has numerous drawbacks in the context of modern water management. It bears no relationship to the natural occurrence, the fluid nature, or the inherent unity and interconnection of the resource 67/. This is reflected in lack of coordination in the overall administrative framework. Even where several uses or activities are combined under the aegis of one agency - as for example, in the U.S. Army Corps of Engineers, whose historic mandate for navigation has been continually enlarged - the result is often merely to enhance the separate and individual power of such an agency and to so strengthen its vertical structure as to make inter-agency coordination difficult except at the topmost levels. A clear example from the United States in the era prior to the 1969 National Environmental Policy Act 68/ was the 'lack of cooperation between the Corps of Engineers and the Fish and Wildlife Service of the Department of the Interior. The Fish and Wildlife Coordination Act of 1958 required the Corps to consult with the Department of the Interior agency before issuing permits for dredging, filling or excavation in navigable waters 69/. It took nine years and an agreement concluded at the apex of the administrative hierarchy (between the Secretary of the Army and the Secretary of the Interior) before this programme could even begin to be implemented 70/.

Uncoordinated sectoral administration may also lead to waste and imbalance both in water management and in the agencies themselves.

To correct the shortcomings of sectoral, use-oriented and fragmented administration, there has been a long-term trend toward areal consolidation. This has taken two forms, not wholly compatible, corresponding either to natural units (river basins) or to artificial units giving regional expression to the supply-demand relationship, which in turn, on a national scale, are included in a single centralized department or are coordinated at the central government level.

2. Valley Authorities

The idea that the unit of planning and management should be the river basin was strongly associated with multi-purpose projects from the beginning of this century. On the planning side, it can be traced from Willcocks' projects for the Nile and Tigrie-Euphrates, through Theodore Roosevelt's statement that "each river system... is a single unit and should be treated as such", to the early British, French, Spanish and Italian basin blueprints of the 1920's, and so on, down to the mid-1950's when the United Nations Secretary-General was able to report to the Economic and Social Council that: "River basin development is now recognized as an essential feature of economic development" 71/. On the administrative side, economic development by river basin units, as opposed to other types of economic region, was implemented more slowly and did not really come to fruition until the 1930's. The pioneering institutions were created in the United States in 1933 in the Tennessee Valley Authority (T.V.A.). This areally and functionally consolidated, autonomous agency was the prototype for a number of others in various parts of the world whose task would go far beyond the management of water resources per se. The act creating the T.V.A. proclaimed its purpose as that "of fostering an orderly and proper physical, economic, and social development" 72/, and this was to be accomplished, inter alia, by development of marginal lands, stimulation of agriculture through the sale of cheap fertilizer, and marketing of power 73/.

Such emphasis on regional planning and administration, and on general economic and social development is reflected in the powers given to the other valley authorities. The Damodar Valley Corporation Act of 1948 directly and specifically charged the Damodar Corporation with "promotion of public health and agricultural, industrial, economic, and general well-being in the Damodar Valley and its area of operation" 74/. The act of 1949 creating the Gal Oya Development Board in Ceylon not merely set as a goal the economic and social betterment of the area, but also entrusted the Board with general administration of the undeveloped part 75/. The Colombian decree of 1960, reorganizing the Regional Corporation of the Cauca Valley, entrusted the Corporation with the promotion of agriculture, industry, social welfare, and development of mineral resources 76/. Similar powers were given to the Comissão do Vale do Sao Francisco in Brazil 77/. In Mexico, the Papaloapan, Grijalva, and Tepalcatepec-Balsas Commissions, all established between 1947 and 1953, included in their scope not only flood control, irrigation, power production, and water supply, but also communications, urbanization and colonization 78/. Another entity with very far-reaching powers was established in Afghanistan in 1953 as the Helmand Valley Authority. The plans drawn up contemplated power generation, land reclamation, irrigation, industrial development, resettlement of nomadic tribes, and the provision of educational institutions, public health centres, and modern housing 79/.

The distinguishing feature of the valley authorities, apart from their broad mandate for economic and social development, has been their administrative structure. The enabling acts envisaged them as highly autonomous entities, corporate in form, separately funded, and responsible to the central government rather than to the water administration or any sector of it. The T.V.A. for instance was made responsible directly to the President of the United States and endowed with greater independence and flexibility than perhaps any other federal government department or agency. Its autonomy was strengthened by lump sum appropriations by Congress, revenues from the sale of power, and a wide discretion in the selection and management of personnel 80/. The Comissão do Vale do Sao Francisco likewise was set up as a purely federal agency, directly responsible to the President, and with

only token representation of the basin states 81/, and the Helmand Valley Authority was made to report only to the Ministry of Finance 82/.

This type of administrative structure, which provides little scope for coordination with the regular government departments in charge of various aspects of water resources use and development, with political entities below the national level, or with user interests, has met with considerable resistance. The history of the valley authority concept in the United States after T.V.A. is illustrative. Proposals for valley authorities have reappeared many times since then, especially for the Columbia River Basin. Admittedly, the international character of the basin complicated the issue, but plans for its unified administration on T.V.A. lines were pressed with vigour, notably by President Truman. Despite presidential backing and extensive hearings, these plans failed, largely because of opposition to any extension of the federal government's sphere of activities and because the existing pattern of water resources agencies was well entrenched and had powerful defenders 83/. Nonetheless, the idea remains perennially attractive and some continued to regard the river basin as a natural, all-purpose region, a unit within which the development of all resources is an imperative to be obeyed as one of the dictates of nature 84/.

There is basis for the claim that a correlation exists between reliance on water projects for economic development, and treatment of the river basin as an economic unit. In the case of T.V.A. for example, per capita income increased at the rate of about 6.3 per cent per annum over a 20-year period, higher than the average for the country; it rose from 44 per cent of the national average in 1933 to 61 per cent of the national average in 1953 85/. However, the T.V.A. evolved in a different way than had been at first envisaged. Initially, it was conceived of as promoting agricultural development and rural regeneration in an economically depressed area, with industry playing a secondary role. What happened over time was an increase in the share of income from manufacturing and trade, due primarily to cheap power, and a decrease in the share from agriculture. In recent years, more and more of the emphasis has been on power production from fossil fuels as the hydro sites reached the limits of their capacity! the T.V.A. has changed from a predominantly water resources entity to a predominantly power-producing entity, based now rather incongruously on a hydrologic unit whose natural boundaries it has transcended.

This kind of progressive discontinuity between river basin and economic area was noted in 1958 by a United Nations panel of experts, who carefully distinguished developed from under-developed areas as follows:

"In regions where economic development is already well advanced, a river basin may lose some of its cohesion as an economic entity because the boundaries of what may be considered an economic unit do not coincide with the physical limits of the basin area. The situation is often different in less developed areas, where because of the very lack of economic development, water projects may have a more dominating influence. When the works are extended to the physical boundaries of a river basin, there will be a tendency for these boundaries to coincide with those of an economic unit 86/".

However, it is precisely in some of the economically least developed areas that the greatest difficulties have been encountered in implementing the valley authority concept of management of all resources 87/.

The reasons for failure may often be squarely attributed to the type of administrative set-up. As the same United Nations panel of experts pointed out:

"A river basin programme, because it is so complex and because it does not fit neatly into the general governmental framework, requires an especially imaginative approach to its organizational problems -all the more in its critical early stages..."

and

"It is apparent that the more extensive the powers conferred upon the river basin authority, the greater will be the peripheral problems that will be raised in reconciling the programme within the basin with national programmes in the same fields 88/."

From the point of view of the overall management of a nation's water resources, the drawback to the valley authorities is not very different in essence from the drawback to purely sectoral administration - that flexibility in a limited area of internal operations is achieved at the very great cost of arbitrariness in external relationships 89/. It was probably for this reason, intuitively, and arising from a fear of economic and even political separatism, that the valley authority concept has rarely been implemented more than once in any individual country. This novel idea was pushed too far too soon before the pros and cons of the river basin as a unit of consolidated water administration could be evaluated in depth. However, the limited acceptance of the valley authorities did not detract from the general acceptance of the river basin concept, by any means. Basin organizations of more modest scope which preceded and had existed alongside the valley authorities continued and, under the impact of pollution control, later developed into a most promising form of water administration - decentralized consolidation.

Among the earliest basin entities of more limited scope than the valley authorities are the Genossenschaften of the Ruhr, brought into being at the turn of the century for the orderly management of water supply and pollution abatement in a densely populated and highly industrialized area 90/, the River Murray Commission in Australia, established in 1913 as a planning and coordinating body 91/, and the Compagnie Nationale du Rhône, set up as a public joint-stock company in 1933 for development of power, irrigation and navigation, with both public and private funding and representation 92/.

3. Coordinating Commissions and Committees 93/

Elements of all three types of early basin administration are to be found, in various combinations, in most of the entities subsequently established all over the world. Coordination and planning, as represented by the River Murray Commission, became subsequently widespread functions of basin entities. Basin commissions and committees created by formal or informal agreement are popular instruments in federal countries for coordinating the water policies of several states or provinces occupying parts of the same river basin. The majority of the commissions created in the United States by interstate compact are of this type. Some are strong commissions, empowered to develop plans, policies, and projects and to allocate waters 94/. Others are entrusted merely with water apportionment, which has already been spelled out in detail in the compacts, and are further limited in their powers by the requirement of unanimity or near-unanimity on decisions 95/. Another example is the planning organization which was set up in 1956 for the Rio Colorado in Argentina by formal agreement between the five basin provinces 96/. In India control boards for several basins or parts of basins (e.g., the Kosi, Rihand, and Chambal) were set up by informal agreement between the states and the central government. They could give only recommendations, which need the sanction of the governments concerned, and actual construction of works is carried out by engineers of the participating states 97/.

Coordinating bodies have also been established by interdepartmental (as distinct from interstate or interprovincial) agreement. Such, for example, were the inter-agency committees created in the United States after World War II. Their primary task was coordination and exchange of information, and they were empowered to act only on matters on which unanimous agreement exists. The basin states were represented on the committees, but the chairmanship was taken in turn by the participating agencies and the ultimate arbiter of matters in dispute is the parent Federal Inter-Agency River Basin Committee 98/.

Another coordinating body of this type is represented, by the committee for the Marikina River in the Philippines, which was created in 1953 and included representatives of the National Power Corporation, Bureau of Public Works, and Metropolitan Water District (later of the National Waterworks and Sewerage Authority), each of which carried out different phases of project development in the Marikina Valley 99/. An example from Mexico is embodied in the Comisión Hidrológica de la Cuenca del Valle de Mexico, with functions limited to study and planning 100/.

Japan provided, by contrast, an example of interdepartmental coordination which was not by any means limited to an advisory and planning role, but encompassed the comprehensive development of a basin, the Kitakami. This approach thus has elements of the valley authority concept of all-purpose development but has been carried out in a very different way. Execution of the programme (embracing flood control, irrigation, drainage, water supply, power production, forestry, mining, promotion of industry, and even city planning) was divided among many ministries and two prefectures within their respective fields of competence, with the coordination entrusted to the Economic Planning Agency, responsible to the Prime Minister 101/.

The distinguishing feature of this group of entities is that they were established on an ad hoc basis for individual river basins as the need for coordination arose, not by a generalized devolution of authority. In that sense they have been experimental and some of the experiments (like the valley authorities) have not been repeated despite their evident success - e.g., the Ruhr Genossenschaften.

A more permanent scheme of planning and coordination based on the river basin has been established in the United States by the Water Resources Planning Act of 1965 102/. This Act authorizes the President to establish federal-state river-basin commissions on a nation-wide basis. They may not be set up except by request of the Water Resources Council or of the governor of a basin-state, with the concurrence of at least half of the other basin-states. The chairman of the commission is appointed by the President: the vice-chairman is elected by the state members. Its membership is representative of: all federal agencies judged by the President to have a substantial interest; the basin-states; any interstate compact commission having jurisdiction over waters of the area; and (when deemed appropriate by the President) either of the United States sections of the two international commissions (with Canada or Mexico). The staff of a river-basin commission is made up of federal-state public officials (neither federal nor state) appointed by the chairman, with the concurrence of the vice-chairman.

The commission is the lead agency for coordination of planning at every level (federal, state, interstate, local and non-governmental) of water and related resources and is required to prepare and keep up to date a joint plan for the area under its jurisdiction. The plan is to include evaluation of all reasonable alternative means of achieving "optimum development", a mandate which foreshadowed the evaluation of alternatives required later under the National Environmental Policy Act.

The operative element in the decision-making is consensus. Decisions are not reached by voting, but by agreement between the federal interests on one side, represented by the chairman, and the state interests on the other, represented by the vice-chairman. It is thus essentially a partnership of two and not a broad-based representation of all major

interest groups within a river basin. As such, however, it is an advance on previous comprehensive river basin planning, which included only federal projects. When consensus is achieved, the joint comprehensive plan is submitted to the governors of the basin-states for state action and to the Water Resources Council, with the aim of obtaining congressional authorization and federal action.

Commissions and committees whose powers are confined to coordination and planning have been criticized as ineffectual 103/, but, because they represent less of a threat to the powers of government departments engaged in water resources development and at the same time satisfy the need for some representation of basin interests, they have met with less opposition in practice than have the valley authorities. Arbitrariness has been averted, however, at the cost of efficacy, even in the case of entities with broader powers - this appears to be inherent in the coordination process. One of the very few post-evaluation studies of river basin development under a coordinating type of body had these criticisms of it after several years of operation:

- that there was no comprehensive master plan for the rational utilization of available water in the basin as a whole;
- that the existing plan was a combination of plans, each serving a particular field, and that it lacked the cohesion of an integrated programme;
- that there was no provision whatsoever for assigning to a single agency the responsibility for its execution, or even for administering or supervising its execution;
- that the allocation of funds was not properly coordinated 104/.

4. Comprehensive Basin Entities

Within recent years a number of basin organizations have been established whose functions are neither as broad as those of the valley authorities nor as narrow as those of the planning and coordinating bodies, but include management, distributive and regulatory activities.

This comprehensive type of basin entity is characteristic of developments in Europe. In England and Wales, the powers of basin administration were progressively expanded, in the 1963 Water Resources Act and the 1973 Water Act, until they included pollution control and water supply in their activities, thus embracing all aspects of water management at the river basin level 105/. Similarly, in Hungary basin administration was given wide powers, though with considerably more direction from the central government. Local agencies there, while remaining an integral part of the water administration, have varying degrees of autonomy which, in some instances, include not only permit-giving but also construction 106/. The Hungarian administration can be termed bureaucratic decentralization, whereas the water authorities of England and Wales represent autonomous decentralization. At about the same time this trend toward decentralization was introduced in France, but there the function of the river basin agencies was confined primarily to helping finance the control of pollution 107/. This is also the case in the current reorganization of water administration in the Netherlands, under which water boards are being set up for the non-national waters of the country (national waters are under the exclusive control of the national government) 108/. Both the French and the Dutch entities are quite autonomous.

Autonomous or not, these basin authorities and boards and committees all have broad powers but widely varying scope. Some have authority to own and operate waterworks, some do not. The Hungarian agencies have this responsibility, the British water authorities are in the process of taking over local water supply and sewer systems, and the Dutch boards are expected to do so in time, whereas the French basin agencies have no such mandate and water supply and sewerage remain under local or private ownership and control. Some have enforcement authority - e.g., the British entities - whereas the French do not. The British authorities are empowered to grant permits and make regulations, whereas in France this is still a local government responsibility. But the French agencies can plan, and set goals (in cooperation with the national government), and set standards (and so can the British), whereas in the Netherlands and Hungary, overall planning and setting of goals is done at the national level 109/. All of these entities have authority for pollution control, a factor which, perhaps more than anything else, is responsible for the spread of this newer type of basin administration.

5. Units of Water Administration Other Than the River Basin

Before the river basin concept became widely accepted, water administration below the national level was organized according to political subdivisions, without regard to watershed boundaries, and it remains so still in many countries, both unitary and federal. Indeed, water management functions are frequently performed on a local scale by agencies of the general administration. In France, permits are given by the prefect and sometimes by the local mayor; the situation is similar in Poland and Japan 110/. Water administration by political subdivisions thus may co-exist alongside basin administration (as it does in the United States 111/), and is retained more for reasons of historical inertia and convenience, than in the interest of efficient water resources management.

Quite different is the type of areal organization by non-basin units now being promoted and justified on grounds of efficiency. In many instances these involve inter-basin transfers, carried out to compensate for unequal distribution of water resources and, sometimes, of economic development. Their proliferation has already prompted claims that the concept of the river basin as the appropriate unit of management is obsolete and imposes intolerable constraints. Concerning the Pacific Southwest Water Plan, for example, the Bureau of Reclamation stated:

"In the Colorado River Basin, drainage boundaries have not been recognized as a restricting barrier to water resource development and use for many years. Waters of the Colorado River drainage area either are being, or will shortly be, diverted from the Colorado Basin to be mingled with the waters of the Bonneville Basin and the Platte, Arkansas, Rio Grande, Los Angeles, Owens, Santa, San Diego, Sacramento, and San Josquin Rivers. As water needs become more critical in the West, river basin boundaries will become even less rigid in water and land resource development 112/. "

The California State Water Project has also been claimed as an entirely new concept, a stage higher than river basin planning, and one which carries "the multiple-purpose principle to its logical conclusion" 113/. The same could be said of the Israeli national water grid, and similar examples of inter-basin transfer, some already in existence, some still in the planning stage, such as the Lower Rhône-Languedoc project in southern France; the Texas Water Plan; the Snowy Mountains Project in Australia; the half-dozen plans for combining waters of the Columbia and of Alaskan rivers with those of the Colorado and other western United States rivers; the Soviet projects to divert water from Siberia to the arid interior of Central Asia; and the Indian proposal for a national grid to interlink the Ganga and Cauvery rivers, 2,000 miles apart 114/.

The sheer scale of these diversion projects, actual or potential, staggers the imagination. Some of them involve transportation of water across several drainage divides and state or provincial boundaries, for distances measured in thousands of miles and in amounts measured by the millions and hundreds of millions of acre-feet. The developmental capacity is not lacking. Such huge projects are technically feasible and can be multiplied to the point where a country or even a continent could be divided into artificial units of water distribution and management based primarily on the anticipated needs of the recipient areas. This factor is very important. Whereas river basin development is at least in theory a concept which corresponds to the organic unity of the basin and has internal cohesion, development by artificial units through inter-basin diversion and long-distance transfer implicitly or explicitly proclaims a preference for, or priority of, the recipient areas.

The question of motive enters here. It may be a matter of national policy to promote the economic growth or regeneration of an underdeveloped area by this means - the Lower Rhône-Languedoc project is an example of such intent. Inter-basin transfers on a large scale may also be undertaken to develop a particular sector of the national or regional economy, especially food production. Irrigation is the primary, if not the sole water-using activity projected for a number of these schemes, e.g., the planned transfers from northern Russia into the Volga basin, the Lower Rhône-Languedoc, and the proposed Indian national grid 115/. Since irrigation is the largest consumptive water use, the proliferation of big diversions to arid areas is inherent in the concept of water development by units of need. There is a vital distinction, however, between need and greed. It is another matter when a region, such as the south-western United States, which is already highly developed economically, seeks large volumes of water from areas which, though at a much less intensive stage of economic development, expect to grow economically 116/.

This factor has profound implications for the nature of water law and water administration in such inter-linked areas of supply and demand. The political and economic influence of areas of demand in the western United States has forced the areas of origin at every level to enact legislation restricting water transfers unless there are effective guarantees for their own future needs. California has both a county-of-origin statute and a watershed protection statute 117/. The former reflects the reluctance of northern California counties to have their surplus water transferred to southern California without proper compensation. The latter has been construed by the state's attorney-general as giving priority to future uses of the areas of origin over all uses of the receiving areas to the extent that the water put to beneficial use outside areas of origin can be withdrawn as area-of-origin needs and uses develop 118/. Measures such as this have their counterparts at state and regional levels. Some states (e.g., Colorado) altogether prohibit transportation of water beyond their borders; others allow appropriation for out-of-state use on grounds of reciprocity or in specific instances when the approval of the legislature is obtained 119/. A regional organization, the Western States Water Council, adopted in its Rules of Organization the principle of priority of right in perpetuity of the states of origin 120/.

Two principles appear to be in process of establishment: (i) that future needs and uses of the areas of origin must be provided for before surplus water can be exported; and (ii) that when unforeseen needs arise in the areas of origin for which there is not enough water because of existing out-of-basin diversions, then water exported can be revoked on the basis of priority of right. The second will probably remain more a desideratum than an accepted principle: it is most unlikely that water, once transferred and used in other areas, could be revoked at a later date.

The experience in the western United States points to a lack of coordination and an unacceptable degree of arbitrariness in the administrative set-up. The amount of legislative effort to protect areas-of-origin attests to this, including on a nation-wide scale a clause in the Water Resources Planning Act of 1965 prohibiting the Water Resources Council and the basin commissions established thereunder even to study plans for water

transfer out of river basins 121/. This was meant to be a brake on the enormous power of the federal government to plan and execute projects (most of the large inter-basin transfers were built by the Bureau of Reclamation 122/), which can be most effectively contained by the political strength of the affected states in Congress. Similarly, the 1962 Flood Control Act authorizing the New Melones Project in California contained the following proviso:

"That before initiating any diversions of water from the Stanislaus River Basin... the Secretary of the Interior shall determine the quantity of water required to satisfy all existing and future needs within that basin 123/."

The wording of this legislation gives legal expression to a conceptual dichotomy which is perhaps more than anything responsible for lack of coordination in the planning stage of such projects - that people in areas-of-demand and the developmental agencies themselves tend to think in terms of broad regional development plans. One type of areal unit is thus opposed to another in a confrontation which leads rather to litigation than to the development of mechanisms for coordination. It is noteworthy that in the successive stages of the Pacific Southwest Water Plan in the 1960's, the programme was well advanced and had been substantially revised before there was any proposal for the establishment of a regional commission to coordinate planning and then only for the long-range future; the so-called Initial Plan was supposed to be put into operation as soon as its engineering and economic feasibility had been demonstrated, without reference to any such body 124/. Moreover, it was proposed (by the Department of the Interior) that, in order properly to manage the projected Pacific Southwest Development Fund (which was, *inter alia*, to provide financial assistance and protection to areas of origin), the Secretary of the Interior should be chairman of the commission, with the right to appoint a deputy chairman to serve in his absence.

The concentration of planning and data-gathering capacity in the hands of the agency principally responsible for construction and development - of irrigation projects, in particular - was a controversial issue also in the Central Arizona Project, and prompted one area-of-origin spokesman to say that: "The world's biggest ditch-digger should not judge whether it should build the world's biggest ditch" 125/. The consequence was that the opinions of the exporting and recipient areas differed not only as to type of areal unit but also as to type of administrative set-up 126/. Those in the recipient areas were willing to have the Bureau of Reclamation conduct studies and planning; those in the areas of origin preferred some other kind of institutional arrangement. To date no regional commissions have been established for the comprehensive planning and management of areal units based on a supply-demand relationship in water transfer. This limits the existing mechanisms to what is essentially sectoral administration applied at the regional level, and employing a single agency to represent both the supply and the demand segments of the water unit. A different solution was proposed by consultants to the State of Oregon (an area-of-origin in the northwest-southwest diversion proposals). Endorsing the idea of a federal-interstate compact, they concluded that this:

"most comprehensive approach would... bring all the jurisdictions having substantial power to affect the outcome into a common structure for the management of western water. This would include the states and the Federal Government and, if successful, would provide the best protection for areas of origin, because it would have created agreements and mechanisms for accommodating both water surplus and water deficit areas 127/."

Only a few of the large inter-basin transfer projects elsewhere in the world are administered by an independent or separate entity. In Australia the Snowy Mountains Authority has been responsible for constructing works to supply irrigation water to the arid interior basins of the Murray and the Murrumbidgee, and electric power to the Capital Territory and the states of New South Wales and Victoria. Its areal scope was defined by the Governor-General in 1954 as consisting roughly of the upper basins of the Murray and Murrumbidgee and the upper basin of the water-rich Snowy River 128/. In its execution phase the Authority was set up as essentially a federal agency with its three commissioners nominated by the Governor-General. In the planning stage, both the Commonwealth and the two states were represented on the technical committee. Once finished, the works come under the control of the eight-member Snowy Mountains Council, on which the Commonwealth, the participating states, and the Authority are each, represented by two members 129/.

In the plan for the Lower Rhône-Languedoc (a multi-basin area between the Rhône River and the Pyrenees), execution was put in the hands of a semi-public company, the Compagnie Nationale d'Aménagement du Bas-Rhône-Languedoc, whose shareholders are partly public bodies (such as departments, communes, banking establishments, chambers of commerce and agriculture) and partly private individuals and organizations. The central government retained a close supervision through the commissioner whom it appoints and who has the right to veto the Compagnie's decisions 130/.

6. Metropolitan Units

Another type of administrative set-up based on the supply-demand relationship between two water resource areas unconnected in nature is represented by metropolitan units of water supply and sewerage. This is not by any means a recent development. London began importing water as early as the beginning of the seventeenth century, when reservoirs at Clerkenwell were supplied through the New River from springs near Ware, Hertfordshire. New York put the Croton water system into operation in 1842; tapped the Catskills in 1915; and reached out to the Delaware watershed in the 1950's. Birmingham, Manchester, and Liverpool initiated this process in the last quarter of the nineteenth century. Manchester drew water from the Lake District, 100 miles away, and Liverpool and Birmingham from the rainy hills of Wales. Los Angeles had outgrown its local supplies from the Los Angeles River by 1905 and tapped first the Owens Valley (1913) on the eastern side of the Sierra Nevada, and then the Colorado River (via the Colorado River Aquaduct, completed in 1941) 131/.

Most of the older and larger cities of the world have been forced to seek additional supplies, whether for quantitative or qualitative reasons or both, and many have chosen to develop new sources rather than conserve by economy, re-use, and pollution control what was already available to them. Inevitably, with the passage of time and population growth, these alternative sources of supply have themselves become inadequate, or have become the object of intense competition between municipalities and between municipalities and other users. The nature and type of supply pose a great variety of administrative problems, due to the many different ways in which municipalities, even within the same country, obtain the right to acquire and distribute water.

Under the riparian doctrine, municipal water supply is generally held not to be a riparian right, and most municipalities and water supply entities in such jurisdictions are empowered to develop water from river basins and large stream systems by direct statutory authority, which extends also to import from other basins. Birmingham, for example, was enabled to make impoundments in the Welsh mountains and to bring water long-distance by pipelines through its enabling act of 1892. New York City has acquired water through condemnation of riparian rights in the Upper Delaware River Basin, under authority contained in the city's Administrative Code 132/. Under Spanish law and in countries which derived their law from Spain, such as Mexico, cities acquired water by pueblo right, a right to the use of waters of rivers or streams passing through and over or under the

surface of their allotted lands as far as was necessary for their inhabitants 133/. Even in parts of the United States which were once under Spanish law, the pueblo right still obtains. Los Angeles is the outstanding example; its right, dating back to 1781 when the pueblo was founded, has been held superior to that of a riparian or an appropriator 134/.

Under systems of administrative disposition, local authorities and other entities which supply municipal water must have a permit or concession like other users. In Spain a concession is the normal means for acquiring such right. When granted to a supplier it is for a fixed term and reverts to the direct users (the municipality) on expiry! when granted to the municipality directly, it is perpetual 135/. In Israel, by contrast, the right, called a production license, is issued once a year and annually re-examined with reference to a fixed per capita quota of water 136/. In the western United States, under the prior appropriation system, a city or supplier acquires its right like any other appropriator. However, its priority may be determined by considerations other than the fundamental "first in time, first in right" rule. The California Water Code, for example, states that an application for a permit by a municipality for domestic purposes "shall be considered first in right, irrespective of whether it is first in time" 137/.

Then there are cities which simply purchase water from a wholesale supplier - a district, an authority, or even a national agency. Districts are increasingly common in the western United States 138/, which has such huge distribution systems as the Metropolitan Water District of Southern California, supplying Colorado River water to Los Angeles and other cities of the region. Arizona law authorizes multicounty water conservation districts, which in turn contract with the Secretary of the Interior for water from the Central Arizona municipalities; the latter can also purchase project water directly by contract with the Secretary of the Interior 139/. Such purchases are common in the West, wherever Bureau of Reclamation projects have been built with this purpose in mind.

Where the central government enters the picture as supplier and distributor of municipal water through special agencies 140/, or through regular government departments 141/, or where regional and river basin entities of multipurpose scope have this responsibility 142/, there is at least the possibility that municipal consumption can be kept in balance with overall water use plans and with national and regional economic plans 143/. The situation is very different with the regional entities established solely for municipal supply. They constitute, again, a type of sectoral administration within a regional context. They are an increasingly common type in areas with a rapidly coalescing network of cities which compete for the same water supply and opt for this solution so as to achieve economics of scale and a more dependable and perhaps cheaper supply. They need bargaining power and often attempt to bargain over a wider area than they have water to serve; this forces them to demand more water, leading in turn to further expansion of the service area. One entity which has been charged with this type of "empire building" is the Metropolitan Water District of Southern California 144/. Large cities which, because of the superior organization of their water supply and distribution systems are in a position to serve surrounding communities, have frequently used water supply as a lever and even as a form of blackmail to annex territory outright or to force small municipalities to belong to a metropolitan unit of administration for various other purposes.

The problem is compounded by the legal advantage urban communities have in competition with other users, and by their general ability to pay a higher price for water. Most jurisdictions the world over rank domestic and municipal use at the top of their hierarchy of priorities, and the power of eminent domain enables municipalities as such preferred users to condemn other users (generally, but not always, providing compensation is paid). The competition is especially severe in arid areas with irrigation agriculture. It has been said of the new "urban oases" in the western United States that:

"These cities have not come to terms with aridity by depending on a level of water consumption that the natural streamflow can support; they are in, but not of, the desert." (Emphasis added) 145/

In the American West, during the decade 1950-1960, municipal withdrawals increased 274 per cent, as compared to an increase in irrigation deliveries of only five per cent, and in one five-year period alone, irrigated acreage in a metropolitan county decreased 52 per cent 146/. In the process, irrigation districts throughout the West "became transformed into municipal water-supply agencies. But this type of acquisition of irrigation water rights around the fringes of an urban area is not usually enough to satisfy the needs of a large metropolis, which must plan ahead for steady increments in supply. The next step is to acquire new supplies by transfer from areas which are less developed 147/,

When water is imported to a region where the existing supply would otherwise be the most obvious constraint on urban and industrial development, the population may exceed the other physical and social resources of that region. In the absence of any overall planning, development occurs on the expectation that water will be provided as and when it becomes necessary. This has been the pattern in the Los Angeles basin of southern California. The problem is not confined to the developed countries, but extends now to the developing areas of the world. In 1970 there were 133 "million" cities: 44 in Asia, 34 in North America, 29 in Europe, 10 in the Soviet Union, 9 in South America, 5 in Africa and 2 in Oceania. Their number had grown by 29 in the preceding decade 148/. As a United Nations study points out:

"Virtually all of these have spilled over into adjacent areas of varying size and density. In so far as metropolitan use of water is concerned, these agglomerations represent an imposing institutional problem hardly foreseen a few decades ago. Servicing them requires large amounts of water and the multiplicity of their water demands for the future requires detailed scrutiny. Their management poses difficulties everywhere 149/."

Quite apart from development by territorial expansion into fringe areas, the formation of these metropolitan units is also encouraged by legislation aimed at the consolidation of many small water-supply and local government entities. Amalgamation of this type is by no means a recent feature. At the beginning of this century, the Metropolitan Water Board of London was empowered to purchase and carry on the undertakings of eight companies which had been supplying the city for a hundred years or more 150/. Such examples could be multiplied in every part of the world. But the scale of consolidation is growing. Toronto Metro, for example, was formed in 1954 by legislation which brought together as a federated government thirteen separate municipalities, not one of which favoured such a reorganization 151/. (in Canada, provincial legislatures have the power to impose reorganization on local governments.) In the United States, the Demonstration Cities and Metropolitan Development Act of 1966 fosters large-scale development by requiring that applications for federal financial assistance for water supply projects (among others) be submitted to an areawide planning agency 152/.

This kind of legislation, in attempting to bring about a uniformly high degree of quality and efficiency in service and to effect economies of scale, exacerbates the problem of how to integrate such huge semi-autonomous and autonomous metropolitan units into the overall framework of water administration at the river basin and national level. The U.S. Demonstration Cities Act, for instance, postulates an areawide planning agency composed of or responsible to units of general local government in the area to be served 153/. There is no mention of coordination with areas of supply. This is an old story, of course. When Los Angeles reached out for Owens Valley water, valley residents had no opportunity to argue against the capture of their rights until the city presented them with a fait accompli; their reaction then, though violent, was futile 154/.

Nevertheless, it is possible to integrate large metropolitan water supply and sewerage units into a river-basin administrative structure. Throughout the progressive consolidation of water administration in England and Wales along river-basin lines from river boards to river authorities to water authorities, the larger British cities and their water supply entities were integrated into the regional framework, until "water" London, for example, became as a result of the Water Act of 1973 merely a division of the Thames Water Authority, albeit with a powerful representation (20 members) 155/. The arbitrariness of much of the earlier British legislation authorizing municipalities to acquire watersheds and build impoundments for long-distance transfer has been mitigated by the 1973 Act. For example, if the Severn-Trent Water Authority (to which area the city of Birmingham now belongs) acquires an estate or interest in land in Wales for reservoir construction or operation, it must convey the estate or interest to the Welsh Authority who then leases it back to the Severn-Trent Authority 156/. In default of agreement on terms between the two water authorities, the matter may be settled at the higher, national-level 157/.

In the United States, the inter-state compact, creating a commission with broad management powers, has proved a potentially useful administrative tool in an inter-basin transfer situation. One example is the Delaware River Basin Compact of 1961 158/. Both New York City and Philadelphia have had their rights to water of the Delaware River system determined by the Compact, and in a time of acute shortage (1965-66), New York City was forced to release water from city-owned upper basin reservoirs to provide for the needs of Philadelphia and other lower-basin municipalities.

7. From River Basin to National Consolidation

It would seem that the integration of water administration at the basin level has been paralleled by a trend toward consolidation at the national level. The river basin entities then become decentralized components of a unified national water administration. This process has taken place in England and Wales, in Hungary, and in the German Democratic Republic. It is also exemplified (but solely for planning and review) by the relationship between the river basin commissions and the Water Resources Council in the United States.

In England and Wales the consolidation proceeded over a period of some three decades. By the River Boards Act of 1948, 32 river boards replaced 53 catchment boards, 1,600 pollution prevention authorities, and 45 fisheries boards 159/. Then, under the Water Resources Act of 1963, the river boards were consolidated into 27 river authorities, and in 1973, by the Water Act of that year, the river authorities were replaced by ten regional water authorities under the joint direction of the Secretary of State for the Environment, the Secretary of State for Wales, and the Minister of Agriculture, Fisheries and Food 160/. Essentially, the main responsibility at the national level falls on the Secretary of State for the Environment, since the functions of the Secretary of State for Wales relate chiefly to the single Welsh water authority and those of the Minister of Agriculture, Fisheries and Food to land drainage and fisheries. All three, however, are required jointly to formulate a national policy for water in England and Wales, and to secure its effective execution by the water authorities, to whom the Ministers can give general directions, aided by the National Water Council, which is an advisory body 161/.

A somewhat similar administrative structure has evolved in the German Democratic Republic Basin authorities (Wasserwirtschaftsdirektionen) had been established there in 1958 in seven basins or groups of basins, with administrative centres at Dresden, Magdeburg, Erfurt, Halle, Potsdam, Cottbus, and Stralsund, respectively 162/. A national Water Management Agency was created in 1969, but within three years was absorbed, together with the basin authorities, into a new Ministry of Environmental Protection and Water Management 163/.

The Hungarian institutional framework resembles the British and East German administrative structures, in that its twelve regional water authorities, corresponding more or less to hydrologic units, are supervised by a single national entity of cabinet rank (though not a separate ministry), the National Water Authority created in 1953 164/. The consolidation of water management at the national level is not absolute, however, and in this, too, the Hungarian structure resembles its British and East German counterparts. Certain functions still pertain to other entities. The Ministry of Agriculture, as in England and Wales, retains a correlative jurisdiction with the National Water Authority, and so does the Ministry of Mining and Power Supply, on water matters within its purview. Coordination of water development planning is carried out by the National Water Management Commission, under the chairmanship of the president of the National Water Authority.

All of the foregoing entities in Europe have broad planning and executory powers and exercise, by their own authority and by devolution of that authority to river basin bodies, a close supervision over most aspects of water resources management. A weaker type of overall administration is represented by the U.S. Water Resources Council, which coordinates the work of the river basin commissions established under the Water Resources Planning Act of 1965 165/. The Council is a federal entity whose full members are the heads of the departments and agencies most closely concerned with water resources planning and development. Since the river basin commissions are for planning only, the Council's functions with respect to them are likewise limited: to coordinate federal agency programmes in river-basin planning; to request the establishment or terminate the existence of a river basin commission; and to receive, review and transmit to the President for forwarding to Congress the plans of the river basin commissions. It has other functions, however, chief among which has been to promulgate a set of uniform planning standards applicable to, and binding upon, all types of federal and federally assisted water and related land resources programmes, whether or not they are carried out within a river basin context 166/.

The type of two-tier water administration described above, with coordination at the national level and decentralization at the regional or basin level, was endorsed by the United Nations Interregional Seminar on Water Resources Administration at New Delhi in 1973, as follows:

"...(t)he model appropriate for a unitary State is the consolidation of water activities - conceivably belonging to a river basin or basins. This could be done under the aegis of regional administrative agencies, corresponding as closely as practicable to watersheds, with the coordinating and decision-making functions entrusted to and centralized in one water agency of national scope 167/."

The consolidation of water administration at the national level has sometimes been carried further by efforts to bring the management of all natural resources under one agency. As previously noted, this has already taken place in England and Wales and in the German Democratic Republic; water management functions of the British Ministry of Housing and Local Government under the Water Acts of 1945, 1948, and 1963 were transferred to the Secretary of State for the Environment, and those of the East German Water Management Agency were transferred to the Ministry of Environmental Protection and Water Management 168/. In the United States, also, this unitary approach to the environment produced a consolidation of water pollution control with other elements of environmental protection under a single agency, when responsibility for administering the Federal Water Pollution Control Act was transferred from the Secretary of the Interior to the Environmental Protection Agency 169/. Such institutionalized recognition of the interdependence of all elements of the physical environment has enlarged the scope of water administration and added a whole new dimension to it, but has also brought new problems in its wake. When the consolidation is limited to protective functions, as in the U.S. Environmental Protection Agency, there is an unambiguous mandate. When, however, the environmental

agency inherits operational and developmental responsibilities in the process of consolidation, as appears to have happened in the British and East German systems, there is the potential for conflict between conservation and development. In the short time since these nationally integrated entities have come into being no clear indication has emerged as to how such conflicts are to be resolved.

III. THE INCREASED SCOPE OF THE ADMINISTRATIVE FUNCTION

1. Expanding the Concept of Public Waters

Parallel with the overhauling of the administrative structure, administrative intervention is not only being extended to all waters on and in the ground, but also to those of the atmosphere, thus embracing the entire hydrological cycle. Administrative intervention in the use of water is, of course, nothing new; it is its scope and reach that are novel. Major bodies of surface waters were subject to some state or community control since Roman times and probably much earlier 170/. Water itself was considered in Roman law as common property, res communis 171/. However, streams were either assigned to the ownership of the state for the people, or were considered as belonging to the landowners. The Digest declared that major (perennial) streams were public 172/ and their use was to be regulated by the state 173/, whereas lesser (torrential) streams were indistinguishable from private property 174/. It is probable that, whereas the streams as streams belonged to the public or to the landowners, the water in them remained res communis, that is, belonging to no-one in particular 175/.

State ownership as the basis for control of navigable waters was retained and elaborated in the civil law of European successor states of the Roman Empire under the principle of public domain, or state property which cannot be alienated except by law 176/. The res communis aspect of Roman law, on the other hand, became the basis for control over navigable waters in common law countries. Through judicial interpretation, waters that were susceptible to public or common use for navigation became public, and the protection of navigation served as justification for the government's intervention 177/. Other streams could not be used by any except the riparians, to whom belonged only a right to the use of the water, whereas the water itself was considered a common. 178/

While navigability without state ownership served to designate waters as public in the common law countries, and navigability with state ownership made waters public in some civil law countries, such as France, it was perhaps most often through artificial expansion of the concept of navigability itself that flowing waters were brought under administrative control. In France, for example, this was done virtually by administrative enumeration. The law of 1910 declared that streams in the public domain were those which had previously been pronounced such because of their navigability or floatability, or which entered the public domain as the result of public works or purchase by the state irrespective of navigability or floatability. Accordingly, the Code du Domaine Public Fluvial requires a decree of the Council of State for including or excluding a waterway from the public domain 179/. The law of 1964, by creating a new category called "mixed waterways", extended the administration's control over non-navigable and non-floatable streams. Mixed waterways are established by the Council of State and are assimilated to streams in the public domain, though the beds remain in private ownership 180/

In the United States, federal regulatory power over waters was achieved also by expanding the concept of navigability in a legal sense - subsuming it to interstate commerce - and then by discarding it altogether. In 1824, Chief Justice Marshall equated interstate commerce with navigation in the famous saying: "All America understands and has uniformly understood the word commerce to comprehend navigation" 181/. Since then the power of Congress has expanded to include projects in which navigation was merely incidental. A 1948 case, Oklahoma v. Atkinson, made it clear that the federal government's power based on the commerce clause embraced also the non-navigable tributaries of navigable

streams 182/. In 1972, the Federal Water Pollution Control Act Amendments extended federal control to "waters of the United States" without mentioning navigation 183/. The courts interpreted these waters as not necessarily navigable, but any waters linked in any way with interstate or international commerce over which the federal Constitution gives control to Congress 184/, e.g., through use by interstate travelers, sale of fish in interstate commerce, or utilization by business and industry engaged in commerce across state lines. There are very few waters not covered by this extremely broad interpretation; indeed, disgruntled protesters against the provision claim that it is applicable down to the smallest farm pond or ditch.

France also, but much earlier, ceased to seek the basis for control over flowing surface waters exclusively in navigability. Governmental control over non-navigable streams was extended through the claim to control constructions in stream beds. Legislation of the Revolutionary era and mid-19th century had brought even the non-navigable and non-floatable streams under administrative regulation for certain purposes, but had left unclear the status of the beds of small streams. The law of 1898 settled the controversy over the beds of small streams in favour of private ownership, but reaffirmed the authority of the administration. The riparians of non-navigable and non-floatable streams could use water within the limits of the law, but in exercising their rights they had to conform to administrative regulations, especially for any construction, such as dams or mills: only simple cutting in banks for irrigation was excepted 185/.

In Spain and Italy, both civil law countries, the extensive administrative control was achieved more smoothly by sticking closer to the Roman meaning of public waters, without narrowing it down to "navigable" as France had done. The Spanish Law of Waters of 1879 made public those waters which rise continuously or discontinuously on public lands, pluvial water that falls on public land, and all rivers, springs and arroyos flowing in natural channels: thus, only such minor surface waters, not in channels, that began on private land were excepted 186/. Italian law was greatly influenced by the French code, but departed from the French model in that it included in public waters both navigable and non-navigable streams (the latter being construed by some as equivalent to the perennial streams of Roman Law) 187/.

Generally, modern water laws have abandoned the piecemeal and artificial extension of basic criteria such as navigability. Instead, control is achieved by declaring that waters belong to the state or to the state in trust for the public, or simply to the public or to the people 188/. Whereas declarations of state ownership have an ominous ring, suggestive of a limitless property right, the trust principle, like the principle of public domain, protects at least the major waters from alienation 189/. Thus, if coupled with the constitutional right of the judiciary to review legislation, the public trust formula may provide some brake not only on the administration, but also on the legislature.

A. Groundwater as public water

The dichotomy of private/public waters lingers longer in the case of groundwater. In common-law countries, underground streams are subject only to riparian rights, like surface streams. But all other forms of groundwater, lumped together under the term "percolating water", are considered as belonging to the holder of the title of the overlying land, who has a substantially unrestricted privilege in their use 190/. A process of curtailment of common-law rights to groundwater began in England and Wales in 1945 and in Victoria (Australia) in 1969, but was accomplished without actually placing the resource in state or public ownership 191/.

Spain maintains a long tradition, enshrined in the laws of 1866 and 1879 and in the Civil Code of 1889, that private ownership of land entails private ownership of percolating groundwater 192/. Only in special areas - e.g., the Canary Islands, Andalusia, Baleares, and Almeria - and by special decree-laws subjecting such groundwater to administrative control has there been any modification in this regime 193/. Argentina, a country influenced by Spanish water law, still gives a landowner a preferential use of underground water, even though, by a 1967 amendment to the federal Civil Code, groundwater was placed among public waters, that is, in the modern and flexible approach of Argentine law, waters which satisfy or may satisfy the general interest 194/.

France, also a country with a long tradition in water law, left groundwater to the disposition of the owner of the land until little more than a decade ago. The law of 1964 still leaves him an unrestricted use for domestic purposes, but, like the law of 1852 concerning non-navigable streams, for other purposes subjects any construction for abstracting groundwater to administrative supervision. It is only in the special zones for water development established by law that the capture and use of groundwater actually require an authorization 195/.

The maintenance of different regimes for ground and surface waters is fast disappearing in the American West and had already disappeared in countries with new water codes that make a clean break with the past. In all states of the U.S.A. in which the prior appropriation system applies, underground waters flowing in definite channels are public and subject to appropriation and, hence, permit requirements 196/. In most of them percolating water is also public and subject to prior appropriation 197/. Some of these states have enacted separate underground water codes to that effect 198/, while others have simply extended their statutory provisions applying to surface waters to include groundwater 199/.

There is no distinction between surface and underground waters in the Israeli Water Law of 1959, one of the new codes that start from a basic premise of public ownership or control. This law proclaims all water resources public property "under the control of the State, and intended for the needs of its residents and the development of the country" - essentially a public trust concept 200/. Ownership of land does not confer ownership or right to use groundwaters 201/. Such use is governed by permit requirements, like that of surface water.

Among the newer codes that make a radical break with the past tradition are two in areas where Moslem customary law once prevailed - the Turkish Act of 1960 and the Iranian one of 1968. Both are water nationalization laws, subjecting all waters to state control by graduated stages, and imposing licensing requirements for exploitation and use of groundwater. Both, however, also permit a limited amount of extraction and use by individuals (the landowner in Turkey, the well-owner in Iran) without special authorization 202/. This is perhaps due to the difficulty of controlling small extractions, because the former Polish Water Code of 1962, for example, which generally required permits for water use, exempted shallow wells 203/. Similarly, in England and Wales, the Water Resources Act of 1963, which curtailed riparian rights, permitted the occupier of land to extract an unlimited amount of groundwater for domestic purposes without a license 204/.

B. Atmospheric water as public water

The administrative control of atmospheric water is in a stage of expansion and development. The public status of such water, if not explicitly stated, may be deduced from laws which consign all waters to the state 205/, or, in common law jurisdictions, by extension of the common property concept of flowing water. This deduction is further strengthened by the fact that the air space in most, if not all, jurisdictions is public and the claim of cuius est solus eius est usque ad coelum can no longer be taken seriously 206/.

The development of atmospheric water shares a number of problems with the development of groundwater, such as, how much free use of the water produced should be left to the individual or entity best situated to take advantage of it? As far as groundwater is concerned, in some systems of law it is the developer, not the owner of the overlying land, who is given the right to use it. The developer's right to groundwater exists, for example, in Moslem customary law, and is also to be found in the Spanish Law of 1866 (with respect to artesian wells), the 1960 Water Code of Jujuy (Argentina), the Bolivian Water Law of 1906 (with respect to water under public land), and the Philippine New Civil Code 207/. It is thus quite a widely diffused principle in law and may well become applicable to waters produced by weather modification even in those countries which place all waters under state control. In fact, there would be no incentive to privately organised weather modification operations if the water produced were not available to the modifiers. It is a different matter where production of water is carried out by the administration itself (as in Romania, where all well-sinking is done by state concerns 208/), although even here the principle also applies. Indeed, it is embodied in California law, which provides that:

"Any county, city, city and county, district authority or other public corporation or agency which has the power to produce, conserve, control or supply water for beneficial purposes shall have the power to engage in practices designed to produce, induce, or control rainfall or other precipitation for the general benefit of the territory within it 209/."

Where the entity is also the user, this is tantamount to a developer's right. In the case of groundwater, both the right to produce and the right of use are usually set forth explicitly in statutes, but many of the existing weather modification laws, though they require a license for the actual operation, do not specify who can use the water when it is produced 210/.

Legislation on the subject of licensing goes back almost three decades in the United States, and about thirty states have some statutes on atmospheric water. Techniques of weather modification can be employed for various purposes, from fog dissipation at airports to the dispersal of violent storms, but many of the state statutes (in contrast to U.S. federal law) confine the definition of weather modification to cloud seeding for the production of rain 211/. Most of the states concerned have established an entity to review and approve weather modification activities, but some of the entities are quite separate from the water administration. In the state of Oregon, for example, this function is carried out by the Supervisor of Pest Control of the Plant Division in the Department of Agriculture 212/. The degree of control exercised varies widely. In some states licensing is a mere formality for the registration of operators and requires no demonstration of competence 213/. In others, the operator is required to show proof of his qualifications and proof that the activity is beneficial to water conservation, agriculture, or other purpose, and not harmful to public health or safety 214/.

At a federal level in the United States no single agency has responsibility. The only federal regulatory and policy legislation is the 1971 Weather Modification Reporting Act, which requires any person engaged in weather modification to submit reports on the activity 215/. Rules and regulations for implementing the act were promulgated in 1972 and make the National Oceanic and Atmospheric Administration (NOAA) the receiving agency for the information 216/. There is a general reluctance to develop federal regulation, or give exclusive control to any one agency, until current research programmes are completed. The National Water Commission has recommended that, in the meantime, the regulation of operations continue to be exercised by state and local entities, and that the 1971 Act be made applicable to federal agencies, which it is not now 217/. There has been considerable pressure from the National Advisory Committee on Oceans and Atmosphere (NACOA) to consolidate all the federal effort in research under NOAA 218/. Add to this the fact that NOAA is designated (at least for the time being) the "responsible agency" for the United States in the 1975 Canada-United States agreement on exchange of information

concerning weather modification 219/, and it begins to emerge as the lead agency. Its counterpart in Canada (which also has a Weather Modification Information Act) is the Atmospheric Environment Service 220/.

Neither of these national entities is part of the water administration, and it does not appear likely that the water resources administration in either country will be the ultimate regulatory agency, since so many other elements (aviation and defense, for example) enter into consideration. In the United States, the Task Group on the Legal Implications of Weather Modification proposed that none of the existing federal agencies engaged in research and operation be charged with regulatory functions, but that these be carried out by a new and specially designated entity 221/. The history of proposed federal legislation on the subject in the United States indicates groping for an administrative structure. A decade ago, bills introduced in Congress would have given the major responsibility to the Department of the Interior, with the primary purpose of increasing the yield of water. This was criticized as too narrow a field. The Bureau of the Budget, for example, argued against subordinating all federal activity in weather modification to water resources augmentation, and thereafter, most of the legislative effort took a different direction 222/.

In view of so much uncertainty, the authors of the recent Model Water Code advocated national administration of weather modification as the most desirable form of regulation, because weather transcends boundaries 223/. On this ground the river basin would not appear to be an appropriate areal unit, and yet it makes as much if not more sense to have such activity regulated by river basin entities as by political subdivisions. And, indeed, the legislation of some other countries on this matter shows a water-oriented approach. In Cordoba Province, Argentina, for example, the new Water Code entrusts permit-giving for works connected with weather modification to the water administration, but with the cooperation, when necessary, of the aviation and meteorological agencies 224/. The Swiss federal order of 20 June 1975 squarely places weather modification within the purview of the federal administration along with other aspects of water resources development, but limits its scope to precipitation modification 225/. Similarly, Part III of the 1974 Colombian National Code of Renewable Natural Resources and Protection of the Environment (on non-maritime waters) is made applicable to atmospheric waters in terms of regulation and development. Furthermore not merely the development but also the conjunctive use of atmospheric waters with surface and underground waters are placed within a basin hydro-graphic context and subject to the Administración Pública 226/.

2. Water Pollution Control

The expanded role of the water administration has been rounded out with the assumption of increasing responsibility for water pollution control. Ministerio legis water rights systems, such as the riparian rights and early prior appropriation regimes, left whatever pollution protection and control there was to the general courts. It is why the early anti-pollution laws were, as a rule, penal in character, and though they did occasionally contain permit provisions (as in the U.S. Refuse Act of 1899 227/), these remained dormant.

The modern, full-scale intervention of the administration in pollution control began on the one hand with the introduction of standards, and on the other with the use of effluent charges. In their inception effluent charges were contemporary with or even preceded the early general pollution laws, but until quite recently, when they became in vogue, their use was limited. Standards and effluent charges aim at the elimination or reduction of the discharge of polluting effluent. The other way to cope with pollution, which was used all along, has been to rely on and to increase the diluting capacity of the flowing water. Flow augmentation storage and release of diluting waters, together with reoxygenation of streams through artificial aeration are employed alongside standards and effluent charges. For example, in Hungary they have been used to prevent fish poisoning

from polluting discharges and to render water suitable for irrigation by reducing the sodium content 228/. In addition, low flow augmentation in drought periods and the maintenance of minimum flows are commonly used techniques. Rules and regulations concerning minimum flow requirements can be found in many modern water laws, including the 1963 Water Resources Act of England and Wales and the French Code Rural 229/. This is a legitimate use of water in certain circumstances, but, if solely relied on to combat pollution, it can lead to waste and excessive consumption of water resulting in unforeseen shortages 230/.

Standards, on the other hand, aim at the reduction of the discharge itself. Water quality standards indicate the desired quality of water by defining the level of permissible pollution in terms of such parameters as BOD, COD, pH and heat. Once a standard of water quality has been established, it has to be related to actual discharge points or sources of discharge by indicating through permits or authorizations the amount of polluting effluent that can be discharged into a particular stretch of stream. The difficulty is to match up water quality standards with effluent limitations. In order to do this on a more scientific and objective basis, the 1972 U.S. Federal Water Pollution Control Act Amendments provided for the establishment of uniform effluent limitations for whole categories of industry, and carried them to the level of technology for controlling pollution obtaining at the present or achievable in the near future 231/. The two levels of technology are expressed as "best practicable" and "best available". The first pertains to the best routinely used technology in a particular industry, the second to the most efficient pollution control which is technologically and economically available, even if it exists only in a pilot stage 232/. This way of approaching the problem reduces the difficulty of relating discharge limitations to water quality standards, and may, indeed, do away with the need for water quality standards altogether.

Because the establishment of standards of this kind requires a large and scientifically sophisticated administration and because, as experience in the United States had shown, their enforcement may be cumbersome and costly, other countries are turning to effluent charges as the preferred means of pollution control. They are used, for example, in France, Belgium, the Netherlands, Hungary, the German Democratic Republic, and, of course, the Ruhr of West Germany, where they originated. In France, charges are established by river basin financial agencies and paid by municipalities and by industry. Municipalities pay according to the number of their inhabitants and industry according to measured quantity of effluent 233/. The point of charges is that the polluters themselves decide whether it is to their advantage to limit effluent or to pay in proportion to the amount of treatment required. The underlying principle is that the polluter should pay for the pollution caused, but it can be subject to different interpretations. It may mean that the cost is to be borne by the polluting entity or by the consumers. One of the reasons for the revival of interest in effluent charges is that they help to internalize external costs and this is considered essential to the proper distribution or allocation of resources

This intensified struggle against water pollution, as already shown, became instrumental in promoting the consolidation of water administration in a single agency and in the revival of the river basin as a unit of water management and planning. Moreover, the search for the most appropriate administrative form for dealing with water pollution is leading, at least in some industrial countries, to a more intimate association of representatives of local interests and of the public itself in decision-making with the authorities responsible for water management. The growing association of the public with the water administration in Europe has been termed in a recent study the emergence of the water parliament 234/.

3. Conjunctive Use - the Integrated Approach to Water Management

The realization at the turn of the century that the waters of a stream and the streams of a watershed constitute a unity led to the gradual acceptance of the areal and functional consolidation of water management within the river "basin. Once that consolidation was accepted and put into practice, however, it became clear that the inter-relationship of waters goes beyond the surface waters of a drainage basin and links them intimately with groundwater and - ultimately - with all waters comprised within the hydrologic cycle. Where this inter-relationship can be identified, a unified treatment and exploitation of all waters as a common pool with interchangeable uses may replace the separate management of waters according to their different modes of occurrence, and so lead to fully integrated and efficient water management. Thus, the principle of conjunctive use was born. Administratively, it is limited so far to the joint management of ground and surface waters, but has potentiality for extension to any sources of water 235/.

Conjunctive use tends to arise in circumstances of great pressure on existing sources of supply and/or the need or the desire to seek alternative, less expensive, often nonstructural solutions, instead of resorting to the traditional means of augmenting supply from new sources via large dams, huge impoundments, and long-distance diversions. Groundwater has physical characteristics that are of great advantage in such an overall programme of management seeking alternatives to major surface development. In many countries it occurs over wide areas and in large volume, stored in receptacles (aquifers) of great capacity, maintaining a steady flow, a constant temperature, and, generally, a much purer quality than surface waters 236/.

The conjunctive use of ground and surface waters has two distinct technical aspects, with correspondingly different implications for water law and water administration. One is the integration of the use of individual wells with the use of nearby surface waters; administratively, this may involve the coordination of a large number of such uses over a wide area, even an entire river basin, but legally it is apt to be a matter of determining (or redetermining) individual rights to such conjunct waters in terms of quantity, duration and manner of use. The other aspect is the large-scale manipulation of ground and surface waters to provide a greater, more certain, more appropriately timed flow or supply, as and where needed. This may involve any or all of such techniques as: aquifer recharge, flood-flow storage in underground reservoirs, the creation of barriers to salt-water intrusion, the release of groundwater to maintain required flows in surface channels and conversely, the release of surface water to maintain groundwater supply, the mixing of waters of different characteristics and different quality, and the development of regional and even national grids for water distribution.

The benefits of conjunctive management, apart from a more reliable and larger supply, include better distribution of water and greater efficiency in use; less waste and loss in transit; better control of floods; less need for surface structures for storage and distribution and, hence, lower capital investment. It is perhaps in irrigated agriculture that the advantages are most significant, for conjunctive use holds out the promise of delivering water with great flexibility and precision according to crop needs, while at the same time curbing seepage and evaporation losses and preventing the twin plagues of waterlogging and salinization. In Haryana State of India, for example, success has been achieved by combining surface water resources with deep and shallow tube-wells in one scheme. Instead of supplying huge blocks of land from distribution canals, the surface water is applied in strips close to the canals and in the belt between the strips, which would thus otherwise be unirrigated, shallow tube-wells provide irrigation water. The infiltration from the irrigated fields provides a steady yield for the shallow tube-wells and they, in turn, act as drains and help to prevent waterlogging 237/. Conjunctive use and management permit surface water resources to be used at one season of the year and ground water at another, permit a groundwater aquifer to be deliberately overdrawn during periods of low surface flow and replenished later, and have the further advantage for agriculture that, when

aquifers are used as storage basins, unlike surface reservoirs, they take no land out of production 238/.

Conjunctive management allows the administration great flexibility, but its abrupt introduction into a long-established system of vested rights can give, and has given (as the history of litigation in the western United States shows), rise to charges of arbitrariness and abuse of discretion. Moreover, it is not a universal panacea. Not all hydrogeological and groundwater conditions are suitable for integration with surface water resources, and even when they are, account must be taken of potentially adverse impacts. For conjunctive use is an artificial intervention of great magnitude in a natural process, albeit in an attempt to correct the damaging effects of previous interventions. It often involves the blending of waters of different quality and characteristics and the introduction of pollutants into aquifers. It changes the routing and timing of surface flows, with results that may be detrimental to some users and to the environment. (An example would be the possible elimination of the pasture and marshland areas, around the fringes of some irrigation projects, that subsist on spills and seepage from surface works and have value for wildlife, grazing and other purposes.) In sum, it is bound to cause changes, and possibly serious disfunctions, in the equilibrium of a water resources system over the long term and requires very detailed and careful preliminary study of all the elements involved.

The hydrological and hydrogeological data necessary for planning the conjunctive use of water resources have not until recently become available to even the intensively developed countries, and developing countries are hampered in this respect by the lack of all but the most basic hydrometric networks. Yet certain of the inter-relationships between ground and surface water have long been known and, in a rudimentary way, expressed in law. Moslem customary law has always taken account of the fact that, in valleys with permeable soils and porous underlying rock formations, quantities of water may be absorbed from precipitation in the higher reaches and later become available lower down either as surface flow or by the digging of wells and underground water galleries. This relationship finds expression in provisions concerning the right of upstream landowners to use the water first (Sunnite and Sh'ite doctrine) and concerning the harim or protected area of watercourses and also wells, in which it is forbidden to sink wells 239/. The concept of the harim was retained in subsequent codifications such as the Mejlle Code of the Ottoman Empire and in the modern legislation of countries, such as Iran, in which Moslem customary law formerly prevailed 240/. Other modern laws implicitly convey this understanding of an interconnection by forbidding wells to be drilled within a prescribed distance of a surface stream 241/.

In most countries until very recently different legal regimes were applied to ground and surface water. Even where considered as public water under administrative control, groundwater has usually been treated as a separate resource under separate management. Techniques of conjunctive use and management have been put into practice, however, under widely differing conditions in various parts of the world - for example, in certain areas of India and Pakistan, in the karst region of the trans-Danubian central mountain range in Hungary, in two pilot projects in the United Kingdom, in tropical north-western Australia, and in the western United States 242/. On a nation-wide scale, these techniques have been in operation for a number of years in Israel, where the greater part of that country's water supply, ground and surface, is piped into and distributed from a national grid, the National Water Carrier 243/.

Conjunctive use, thus, has reached operational status and laws and institutions exist for management, but it is not as yet practised in very many jurisdictions and there are relatively few guidelines to provide for resolution of the legal and administrative problems that it may pose 244/. Nonetheless, one of the major recommendations to governments of the IInd International Conference on Water Law and Administration, held at Caracas in February 1976, was:

"...that governments:

(b) Integrate the management of groundwater with all other available water resources, including, for example, the employment, where practicable, of aquifers for the seasonal storage of surface waters, and the creation or improvement of groundwater recharge catchment areas to minimize losses of rainfall and to capture excess surface runoff 245/."

Experience already gained by some of the western states in the U.S.A. formed the basis for recommendations of the National Water Commission in its report, *Water Policies for the Future*, to be implemented on a nation-wide scale. These recommendations on conjunctive use form a substantial part of the chapter on groundwater management in the policy report and are quite specific, e.g.:

No. 7-1: State laws should recognize and take account of the substantial interrelation of surface water and groundwater. Rights in both sources of supply should be integrated, and uses should be administered and managed conjunctively. There should not be separate codifications of surface water law and groundwater law; the law of waters should be a single, integrated body of jurisprudence.

No. 7-2: Where surface and groundwater supplies are interrelated and where it is hydrologically indicated, maximum use of the combined resource should be accomplished by laws and regulations authorizing or requiring users to substitute one source of supply for the other.

No. 7-3: The Commission recommends that States in which groundwater is an important source of supply commence conjunctive management of surface water (including imported water) and groundwater through public management agencies.

No. 7-4: The States should adopt legislation authorizing the establishment of water management agencies with powers to manage surface water and groundwater supplies conjunctively... 246/

Too often, conjunctive management of waters is attempted only under pressure of depletion and misuse of a resource and widespread conflicts between users. In the western United States, for example, one of the main contributing factors in the enactment of conjunctive use legislation was the common situation in which, as surface waters became fully appropriated and insufficient for the needs of all users, wells were drilled to tap the underflow of rivers and, in effect, enabled groundwater users to siphon off surface water to the detriment of existing surface rights 247/. Where the coordination effort is made only after a crisis has developed, integration is beset with difficulties, as a case study of the Colorado experience has shown 248/.

These difficulties can be avoided or minimized if conjunctive management is adopted at the planning stage and before a crisis is reached. Policy recommendations for conjunctive use have been formulated in the United Kingdom by the (now-disbanded) Water Resources Board as part of a long-range strategy outlined in a national study in 1973. The so-called preferred strategy, selected from among six basic alternatives, would require as much use of groundwater as possible, with conjunctive use of ground and surface waters, including artificial recharge of aquifers; however, a full-scale drought emergency has supervened before it could be put into practice 249/. Indonesia, which is only beginning to develop groundwater but is well aware of its potential, has prepared a detailed scheme for the integration of ground and surface water, together with proposals for the structure of conjunctive administration 250/.

Both the British and Indonesian plans are on a national scale and for developed areas with a historical "bias in favour of surface water use. An example of regional planning in an essentially underdeveloped area is that for the Pilbara region of north-western Australia, where high evaporation poses a problem in surface storage. A three-stage plan is to be implemented, using groundwater in the first and second stages, exploiting the groundwater beyond its long-term yield in the second stage (in effect mining it temporarily), and switching to surface use in the third stage after completion of surface storage, giving the aquifers time to recover. Thereafter, surface storage would be used for supply and recharge for as long as available, alternating with groundwater use. It is claimed that such development, using groundwater first, is especially suitable for underdeveloped areas with limited water resources, because of its initially lower capital investment and the deferment of building expensive surface structures until later stages 251/.

The need for careful investigation, intensive hydrogeological and hydrological studies, and an interdisciplinary approach has been repeatedly stressed 252/. The integrated study of ground and surface waters was recommended in 1971 by the Conference on Hydrology and Hydrometeorology in the Economic Development of Africa, as follows:

"Groundwater resources being closely related to surface water resources, hydrological and water resources studies should involve both surface water and groundwater in an integrated approach. This would apply in particular in basin-wide surveys, calculation of water balances, determination of water resources availability in quantity and quality, taking into account the social and economic factors 253/."

Policy recommendations of this nature are expressed in a general way in legislative provisions concerning data-gathering - for example, the Peruvian General Water Act of 1969, which is not specifically aimed at future conjunctive management but merely declares that the State shall:

"...conduct and update all surveys, whether hydrological, hydrobiological, hydrogeological, meteorological or other, which may be necessary in any watersheds of the national territory 254/."

More directly to the purpose of conjunctive management and at the instigation of the state engineer, the General Assembly of Colorado appropriated funds to set up a computerized water data bank in furtherance of the law of 1969. This data bank contains records of all adjudication proceedings on water matters, historic runoff and climatological data, surface diversion and well drilling records, characteristics of aquifers, wells and surface storage, and provides the means for future studies, analyses, forecasts and monitoring 255/.

In the absence of such a sophisticated tool as a computerized data bank, some degree of on-going evaluation of a conjunctive use programme is essential. Certain existing legislative provisions pertaining to elements of conjunctive use - such as aquifer recharge -contain requirements for monitoring the effect of operations. For example, under the recharge chapter of the Israel Water Law (added in 1965), the licensee (which, for practical purposes, happens to be the National Water Authority, Mekoroth, since there are very few private operations) must carry out periodical tests of the effect of the operations on water resources in the area 256/. In New Mexico, which has a complex system whereby groundwater appropriations are only permitted subject to the condition that surface water rights are retired in proportion to the groundwater pumped, the state engineer has set precautionary limits to an operation in the absence of sufficient hydrological information to predict its effects. In 1972 a permit was granted to a municipal water supply company to appropriate groundwater, subject to retirement of surface rights, but the permit was strictly limited in amount for the first five years and the administration retained the power to modify it as conditions might warrant to prevent impairment of surface rights 257/.

Manipulation of ground and surface waters on a large scale and over a wide area requires management by public entities and raises anew the question of whether administration should be based on the supply-demand relationship, creating a wholly artificial unit, or should embrace a natural unit, either the river basin or a groundwater aquifer, or a composite of both. In a small country, like Israel, and under an all-embracing recodification of the law, it has been possible to establish conjunctive management on a national scale within a single unit by means of a single water supply system and, indeed, to institute such a system without ever even calling it conjunctive use. This is an artificial unit, created by pipeline, and is to some extent duplicated in California, where water supply entities purchase imported surface water to supplement local groundwater. The percentages of imported and local water in the total supply are based on the amount of groundwater in storage and the expected increment from natural and artificial recharge, and the operation is more of an accounting procedure than conjunctive management, since the ultimate responsibility resides with the state. An example is the Orange County Water District which buys imported water for supply and for aquifer recharge from the Metropolitan Water District of Southern California, a state agency: the water is imported from the Colorado River basin 258/.

The use of the drainage basin as the unit of conjunctive management is implicit in the recommendations of the Conference on Hydrology and Hydrometeorology in the Economic Development of Africa (1971) 259/ and of the IInd International Conference on Water Law and Administration (1976) 260/ and has been stressed by individual experts also 261/. The British "preferred strategy" embodying conjunctive use would be carried out within a basin context, since the existing system of ten regional water authorities in England and Wales under the 1973 Water Act is organized more or less along drainage basin lines 262/. The Colombian Natural Resources and Environmental Protection Code of 1974 also envisages conjunctive use (of surface, ground and atmospheric waters) with hydrographic basins 263/. This code further defines a hydrographic basin as one in which ground and surface waters form a natural hydrographic network draining to a common outlet and delimited by the surface watershed 264/. However, if the boundaries of the underground waters of a hydro-graphic basin do not correspond to the surface watershed, the basin limits may be extended beyond the watershed to include aquifers whose waters are connected with the surface flow 265/.

Florida's Water Resources Act of 1972, which contains numerous provisions pertaining to conjunctive management, divides the state into five water management districts that may be subdivided into basins 266/. The governing boards of these districts, which have permit-granting powers, are specifically authorized to construct works for groundwater storage and aquifer recharge and for aquifer withdrawals for water supply 267/. The act also provides for the establishment of minimum flows for surface streams and minimum water levels for underground aquifers and bodies of surface water 268/.

The achievement of conjunctive use is predicated on great flexibility in three areas of water law where severe constraints still operate in many jurisdictions. These three areas concern transfer of right, loss of right, and quantity of right. For efficiency in conjunctive management users must be able to transfer freely from use of groundwater to use of surface water and vice versa, so as to balance precipitation, surface and subsurface inflows, and surface and groundwater storage against evaporation, evapotranspiration, runoff, and surface and underground outflows. Moreover, to obtain maximum benefit, it should be possible for users to make such transfers for a period of years, as circumstances dictate, without losing the right, by prescription, abandonment, or other means, to revert to the previous source of supply - for instance, after a long period of aquifer recharge. Legal regimes which prohibit transfer and place rigid time limits to the retention of an unused right make it difficult to achieve the necessary flexibility. It should be possible also for the administration to modify a user's right quantitatively - for example, when transferring from surface to groundwater sources. Surface rights often include a percentage for seepage and evaporation; with use of groundwater a lesser quantity may be needed.

Yet reduction of an individual right or of a group of individual rights in this fashion without a proportional reduction in all rights may be forbidden by law.

In countries, such as Israel, which have nationalized all water resources and in which the administration has ample powers to control transfers and modify permits, the problems of conjunctive use are technical rather than legal. Israel's water law contains no policy statement as to conjunctive use and makes no distinction as between ground and surface waters or types of groundwater, or concerning the inter-relationship between the one and the other - all are water resources subject to the control of the state 269/. The right to use water is not linked to a specific water resource, but only to a specific quantity of water, and the Water Commissioner has authority to change a source of supply at his discretion 270/. A similar power pertains to the Executive in the Peruvian General Water Act of 1969, which authorizes the substitution of "one water supply source serving one or more users with another of similar flow and water quality with a view to achieving a more rational or otherwise better use of resources" 271/.

Water administrations in other jurisdictions have had to institute conjunctive use within the framework of long-established legal regimes through programmes of exchange and purchase of rights. New Mexico, for instance, sought to relate ground and surface water rights administration in the 1950's, by making the approval of new groundwater applications in the valley of the Rio Grande dependent upon the applicant being able to offset the effects of his pumping upon the flow of the river. He was to do this by acquiring and retiring from use surface water rights in graduated amounts and following a time schedule calculated according to a formula devised to so balance the surface and groundwater components that, in the end, the appropriator has entirely compensated for the effect of his pumping on the stream by surrendering rights in an equivalent amount of surface water 272/.

Colorado aimed to achieve conjunctive use by, in effect, subjecting groundwater use to the existing system of surface rights 273/. Under the 1969 Water Right Determination and Administration Act, three alternatives are available to individuals, separately or in concert: (i) the use of wells as alternate points of diversion for surface rights; (ii) the provision of a substitute supply to a downstream senior appropriator, either by installing wells or by purchasing and releasing reservoir water for the senior appropriator's use; or (iii) the development of a plan for augmentation 274/. A plan for augmentation is defined as:

"a detailed program to increase the supply of water available for beneficial use in a division or portion thereof by the development of new or alternate means or points of diversion, by a pooling of water resources, by water exchange projects, by providing substitute supplies of water, by the development of new sources of water, or by any other appropriate means 275/."

The Colorado Act left implementation essentially to private parties (in the absence of any public entity established for the purpose 276/) and required the water administration "to exercise the broadest latitude possible in the administration of waters under their jurisdiction" so as to encourage augmentation plans and voluntary exchanges of water 277/.

Most of the problems affecting conjunctive management of ground and surface waters by public entities appear to concern aquifer recharge and storage and the mixing of water from different sources, with its attendant danger of pollution. Usually, a recharge permit is required, even of departments of the water administration. For example, Mekoroth, the national water authority of Israel, which has been recharging that country's coastal aquifer with water from Lake Kinneret via the national water carrier for more than a decade, does so under license from the Water Commissioner. Recharging may only be carried out for specific purposes: artificial replenishment, seasonal and perennial storage, dilution of water, filtering of flood water, removal of pollutants, and research and

experimentation. Full details of the planned recharge must "be submitted in the application for the license, which is issued for one year only and must be annually renewed. The detailed application is made available for public examination and every producer, supplier, or consumer in the area may file objections. The Water Commissioner sets the conditions of the license, including quantity and quality of the water 278/.

Permit requirements and other detailed provisions concerning recharge and storage are contained in the Florida Water Resources Act of 1972, which specifically empowers the regional water management districts to construct works for water storage in or withdrawal from an aquifer 279/. It lays particular stress on the requirement that storage or recharge water must be of a "compatible quality" 280/. This mixing of waters may countervene provisions in pollution laws designed to protect waters of higher quality than established standards. Such provisions are contained, for example, in the State Standards for Anti-Degradation issued by the federal Environmental Protection Administration's Office of Water Programs in 1972 281/. However, most state standards contain a proviso that the existing high quality of certain waters will be maintained unless and until a change would be consistent with maximum benefit to the people of the state (California) or justifiable as a result of necessary economic or social development (New Mexico), or similar wording.

The problem remains whether the individual recipient of blended water or water of lesser quality from an alternative source has suffered an infringement of his rights. A question of this nature arose in Israel 282/. The case concerned the substitution of water from the national carrier for a pervious supply which was lower in chlorides, and the court upheld the power of the Water Commissioner to direct that a user take water from a different source as long as it was of a quality that he could use, not of a specific quality. A less arbitrary expression of such power is contained in the Peruvian General Water Act of 1969 which declares that the Executive may:

"substitute one water supply source serving one or more users with another of similar... water quality... 283/."

Difficulties may arise also from the storage of water beneath private land. For maximum efficiency in conjunctive management, the water administration should have full control over stored water. United Nations studies have referred to the problem of obtaining land to construct recharge facilities, when the method of spreading basins is used 284/. The U.S. National Water Commission recommended that:

"The States should adopt legislation authorizing the establishment of water management agencies with powers to manage surface water and ground water supplies conjunctively; ... to buy and sell water and water rights and real property necessary for recharge programs 285/. "

Recharge of aquifers may in itself cause adverse environmental impacts, such as waterlogging of the overlying land, and all potentially adverse effects of this nature on the environment, not merely on the water resource, should be taken into account in the development of conjunctive use programmes.

4. Planning

Water planning is one of the most important responses to the increasing demand for water. Once finalized and put into operation, it may determine the allocation of water between competing interests and demands for generations. With the growing importance of irrigated land for food production, it decides the fate of whole regions. Good planning is a blessing; faulty planning may be a disaster.

New sophisticated methods, such as systems analysis and the use of mathematical models, permit planners to foresee with some degree of accuracy the impact of projected development, but they cannot assure that the costs and benefits will be equitably and rationally distributed. It is why, alongside constant improvement in planning methodology, checks on technical solutions are being infused in the planning process. Most frequently, these checks take the form of a requirement to consider and present alternate plans, gradual implementation of the plan with continuous monitoring of performance of the segments already executed, and public participation in order to determine popular preferences and to obtain views and comments from localities and regions where the impact of plans will mostly be felt.

The systematic planning of modern water resources development began with the discovery and general acceptance of the unifying characteristics of the waters of a river basin. The geographical unity of the river basin gave substance to unity of planning. This was recognized by Willcocks three-quarters of a century ago in his plans for harnessing the Nile and the Tigris-Euphrates 286/, and by the (Theodore) Roosevelt administration in the United States at about the same time, as a matter of national policy 287/. In the third decade of the twentieth century basin planning became widespread. In the United Kingdom, it was recommended that a commission be created with jurisdiction over the waters of England and Wales and that the river basins be treated as units for development of all water uses 288/. Planning in France had begun in 1919 and 1920, though at first this pertained primarily to power production, and was only later expanded to multi-purpose basin development 289/. A pilot project was blueprinted in Italy for the development of the Flumendosa River Basin, and, about the same time, a national plan was developed in Spain 290/. In the United States a massive preliminary survey of river basins was authorized by Congress in 1925 and, following this directive, the so-called 308 Reports were prepared by the Corps of Engineers, comprising about 200 separate studies of important river basins with a view to integrated multi-purpose development 291/.

One of the rivers surveyed in the 308 Reports was the Tennessee, and comprehensive development of its basin was soon set in motion with the passing of the Tennessee Valley Act and the establishment of the Tennessee Valley Authority 292/. The success of the TVA led in some instances, as noted above in the discussion on valley authorities, to making the river basin a focal point of planning of all the economic activities of a region. Over-enthusiasm for the concept in the United States resulted in plans for the division of the entire country into economic regions corresponding roughly to the major river basins. These proposals failed to obtain the approval of Congress. The country was not ready to have its administrative map remade in accordance with regional divisions along major river basin lines 293/.

Even though implementation by valley authorities failed of widespread and repeated adoption, basin-wide planning continued to gather momentum. As discussed above, a great many basin commissions and committees were established in all parts of the world, and most of these had and have responsibility for planning. They include the River Murray Commission in Australia, the Rio Colorado planning organization in Argentina, the Comisión Hidrológica de la Cuenca del Valle de Mexico, and several of the commissions established in the United States by inter-state compact, e.g., the Wabash and Delaware commissions 294/.

A further step in the concentration of planning within the basin was the emergence of comprehensive basin agencies, established not on an ad hoc basis for individual rivers, but by legislation of nationwide scope and with a specific mandate for planning within their areas of jurisdiction (as opposed to some of the earlier planning for river basins which was done by non-basin agencies, such as the Corps of Engineers in the 308 Reports). Among them are the basin committees provided for in the French law of 1964, the authorities set up by the laws of 1963 and 1973 in England and Wales, and the basin commissions envisaged in the U.S. Water Resources Planning Act of 1965 295/. The outstanding features of these modern basin planning entities are the multi-objective nature of their planning

function, the comprehensive representation of interests in their membership, and the degree of coordination with all levels of government and, in some cases, non-governmental organizations.

The British water authorities, for example, are required to prepare plans "for the purpose of securing more efficient management of water in their area, including the meeting of future demands for water and the use of water and restoring or maintaining the whole-someness of rivers and other inland or coastal waters in their area" 296/. River basin commissions established under the Water Resources Planning Act in the United States are likewise required to formulate plans in the light of their beneficial and adverse effects on environmental quality on a par with their beneficial and adverse effects on national economic development 297/.

A wide range of interests is represented in the planning process from the outset in these basin entities. The British water authorities and the French basin agencies comprise administration-appointed experts and appointees of local government; the river basin commissions in the United States are composed of representatives of federal agencies, of basin states, and, where necessary of inter-state agencies 298/.

With respect to coordination within their own sphere of operations, for example, the British water authorities are required to consult with every local authority included in their areas and to "have regard" to plans for their areas prepared under the Town and Country Planning Act of 1971 299/. The river basin commissions in the United States are directed to prepare comprehensive coordinated joint plans for federal, state, inter-state, local and non-governmental development of water and related land resources. The inclusion of non-governmental projects is a new departure, since most basin plans in the United States in the past had pertained only to federal or federally assisted projects 300/. The inclusion of related resources and the coordination of water project planning with land use planning (as in England and Wales) is not a reversion to the valley authority concept of the river basin as an all-purpose economic unit, but a recognition of the impact of water resources development upon the use and development of other resources within the basin, and vice versa.

In each of the above instances, basin plans are coordinated at a national level by a national entity. The water authorities in England and Wales are required to submit surveys and plans to the appropriate minister (the Secretary of State for the Environment and the Minister of Agriculture, Fisheries and Food acting jointly in England, and the Secretary of State for Wales in Wales 301/). In France the relevant entity is the Interministerial Water Commission, which collects the information required to draw up general water resources management plans and assists the Minister responsible for the protection of nature and the environment 302/. In the United States, the coordination of the work of the river basin commissions is carried out by the Water Resources Council, composed of the heads of the federal agencies most closely involved in water and land resource planning and development. This body has responsibilities above and beyond the review of basin commission plans and their transmittal, via the President, to Congress: one of its major accomplishments has been the promulgation of detailed principles, standards, and procedures for planning water and related land resources, not only by the river basin commissions, but also by all federal entities engaged in planning water and land programmes 303/.

These examples of river basin planning undertaken on a national scale and with coordination at the national level reflect the decentralization of water administration in France and the United Kingdom and what is known as the conciliar approach to the organization of water management in a federal system of government, like that of the United States. Planning has evolved along different lines in countries with a centralized water administration. In Israel, for example, it was and is carried out by an entity designated for the sole purpose of developing a national water plan, the consulting firm of Tahal.

Tahal has no function defined in the water law of Israel. After the development of the initial comprehensive plan (a general draft was adopted as early as 1950), Tahal continued to prepare general and detailed plans and, now that its work has reached an advanced stage of implementation, it has taken on consulting services overseas. It is perhaps unique as a government planning agency that is also a joint stock company 304/.

In some instances, countries which have an administrative structure organized by "basins, or regions corresponding closely to basins, yet maintain a centralized planning apparatus. Spain, for example, whose administrative organization for publicly owned water is based on the Confederaciones Hidrográficas and the Comisarias de Aguas, has relatively little planning capacity at the regional level. Planning responsibility resides in the National Institute of Reclamation and the Directorate-General of Water Projects in the Ministry of Public Works 305/.

Hungary is representative of a group of countries in which water planning is centrally directed and forms an organic part of national economic planning, yet is distinctive in having, as noted above 306/, a bureaucratically decentralized water administration. The district water authorities do deal with medium-range (five-year) planning and the regional water management key plans are integrated into a National Master Plan for Water Management, but the latter is not prepared by joining together individual basin plans. Rather the aim is to achieve a uniform water management planning from the top down. The Hungarian National Master Plan is similar to development plans prepared in other countries of Eastern Europe (e.g., the Czechoslovak State Water Management Plan, and the Polish National Master Plan for Water Management) and, like them, is dovetailed with general economic planning to an extent which makes water management a distinct subsector of the economy 307/.

Local and regional plans may thus be coordinated and rated, i.e., given priority, formally through national planning in countries which have evolved general binding economic plans, or less formally by coordinating agencies (such as the U.S. Water Resources Council) which are not empowered to prepare such eventually binding plans. Each country adopts the organizational framework and strategy of water planning that best suit its administrative structure and developmental goals. Nevertheless, the physical unit of the river basin requires that at the very least data gathering and surveys, as a preliminary to general planning, be carried out within a river basin organizational context. This is reflected, for example, in the recommendations of the IIInd International Conference on Water Law and Administration, held at Caracas in 1976:

"Since rational water resources management requires planning, governments should prepare a legally supported... basin plan to serve as the terms of reference for determining the beneficial character of water uses, acceptable pollution levels of effluent discharge, public interest requirements, and the extent of powers exercised by water resources management institutions 308/."

Whether the organizational structure of planning be by river basin units or not, the function of planning can be administratively separate from that of project execution or combined with it in one agency. In the instances where it is so combined, it increases the concentration of power of the administration, contributing to efficiency and flexibility, but this calls for the provisions of well-defined constraints on excess. As the examples given in the previous discussion show, there exists a variety of functional arrangements. Some entities have responsibility only for planning - whether for a single basin, such as the River Murray Commission in Australia and the planning organization for the Rio Colorado in Argentina, or for an entire country, such as Tahal in Israel or COPLANARH in Venezuela. Other planning entities also execute projects. The Hungarian district water authorities, for example, carry out both functions, but under a strong central directive, whereas the English water authorities appear to have somewhat more autonomy in this respect.

In some countries, because of size, structure, and historical development, several different agencies have planning and executory authority, separately or in combination. In such situations, directives imposing some degree of uniformity in planning become essential. In the United States, even though federal legislation was passed specifically for planning which provided for the establishment of planning entities in river basins (hopefully and ultimately throughout the nation) under the aegis of a central coordinating body, it did not derogate from the planning authority of existing federal agencies or existing river basin commissions, such as that of the Delaware, which have regulatory and management functions. So, although unification could not be achieved, yet a degree of uniformity has recently been brought about by the Principles and Standards promulgated by the national Water Resources Council. They provide a policy framework, techniques for the application of principles, and highly detailed procedures for carrying out the various levels of planning activities 309/.

The development of binding standards for planning is one way of assuring (apart from comparability of separate basin plans) that planning agencies which have no management or regulatory functions are sufficiently responsible and realistic in their work, and that too much power is not concentrated in the hands of agencies which do have both planning and management authority. Another way of avoiding these twin shortcomings is through the association of local interests and of the public with the planning process 310/. The recent history of large-scale water resources development, both in developed and developing countries, has revealed some shortsightedness in the execution of projects which could have been averted if there had been input at the planning stage from the local population and even from the public at large (since water projects often have an economic and socio-cultural influence far beyond their areas of technical impact).

Study of several large dam projects in Africa, for example, has documented the great stress, anxiety, undermining of local leadership, and cultural impoverishment caused among populations forced to relocate from the impoundment areas 311/. Failure to anticipate the problems and to take these factors into account has obscured the true cost of development if relocation had been done humanely. All too often these projects were pushed forward rapidly with outside technical and financial assistance, but without any involvement of the local people in the decision-making process. The Scientific Committee on Problems of the Environment (SCOPE) noted in a report that most of the serious human population dislocations have occurred in tropical situations, partly because large displacement "would be political suicide in some temperate areas" 312/

These shortcomings are not confined, however, to the less developed countries. A study of the attitudes of federal water planners in the United States concluded that:

"Elitism was the rule in planning. Members of the lay public were considered ignorant, uninformed, and as having no standing to participate in planning... Because of the philosophic base for planning, the concepts, attitudes, and methodologies for planning were such that public participation in planning did not occur to planners as a consideration. Only after great pressures developed within society did public participation become an issue upon which a decision could be made 313/."

Public participation in the United States has been activated chiefly through the very great pressure of environmental concern and is reflected in water resources planning through two separate channels - the impact statement procedure required by the National Environmental Policy Act of 1969 314/ and the Principles and Standards of the Water Resources Council 315/.

Planning standards and specifications such as these which legally mandate the solicitation of public opinion early in the planning process, the widespread dissemination of relevant information, the opportunity for recurrent consultation, and the identification of a "broad spectrum of interests answer the charge of elitism. Nevertheless, they still leave the layman outside the planning structure. This may be inevitable (and, in some circumstances, even desirable). It is difficult, for example, to arouse the interest of the average urban dweller in the planning of metropolitan water supply. In the development of water resources for food production, however, it is essential to have user participation. It has been noted, for example, that farmers have chosen to develop their own sources of supply in some areas, rather than participate in a government scheme:

"Much of the rapid spread of small, private tubewells in northern India and Pakistan has often occurred in areas already well-served by canals, and before the advent of effective government programs for tubewell development. This suggests that many farmers are willing and able to invest heavily in a water supply which they can control to match their water needs 316/."

In other words, planning has failed to match supply to user needs and this may well be for reasons outlined in another study:

"A number of... plans are designed and justified on the ground that they best serve the needs of the region. Not infrequently, however, these needs are conceived and defined by local technicians and bureaucrats or foreign consultants. No matter how objective this identification of regional needs or choice for a suitable development strategy may be, it seldom coincides with the understanding and perception of the beneficiaries, if they are not properly consulted or actively associated with the complete chain of events 317/."

The active association in planning of farmers, fishermen and others engaged in food production may be achieved by going beyond consultation and incorporating them into the planning organization through representation on the planning entity. In many parts of the world this has long been so in the case of projects designed and constructed by users' associations themselves and in the development of cropping, irrigation and water distribution plans 318/. But users take very little part generally in the planning organization of major water resources development except through representation on basin or regional entities which have planning functions, such as the regional water authorities of England and Wales. The British entities combine community representation with user consultation in a way which provides, at least for certain uses, local input of a very detailed kind. It is the duty of every water authority, for example, in the execution of its responsibility for freshwater fisheries, not only to establish a regional advisory committee for that purpose, but also to establish and consult with local advisory committees representing the varied fishery interests in different parts of the authority's area; these local committees are to be composed of "persons who appear... to be interested in any such fisheries", thereby taking account of user knowledge on an individual basis and with reference to a wide variety of circumstances within a small unit 319/.

One important outgrowth of the enlarged perspective of modern planning is the development and consideration of alternatives. Formerly, planning as presented to the decisionmakers, whether for individual projects or for an entire river basin or region, tended to consist of a single blueprint, elaborated solely in terms of its cost-benefit ratio in readily quantifiable components, and was accepted or rejected on those terms. It is now generally recognized, however, that decisions can no longer be based solely on technological and economic criteria, nor can even the initial choice among various development possibilities be left solely to the planners. A United Nations panel of experts outlined the general principles for submission of plans nearly twenty years ago as follows:

"The alternatives should be presented in such a way that at least a broad comparison can be made between them, as to their respective costs, the expected effect on the development of the human and natural resources of the basin, the degree to which water supply and requirements in general, by season and by subarea, are being brought into equilibrium, and last but not least, in what way the alternative solutions affect conflicts of interest between various uses of water, between subareas and between occupational groups 320/."

Since that time, the development of computer technology and simulation modeling has made it possible to assimilate, evaluate and compare a vast amount of data, to evolve methods for the quantification of previously non-quantifiable elements, and to make the planning process truly interdisciplinary, thereby permitting an informed and imaginative evaluation of different versions of a proposed scheme - including the alternative of no action.

The consideration of alternatives forms a major part of the guidelines for planning in the U.S. Water Resources Council's Principles and Standards, which, as previously noted, are binding on all federal and federal-state agencies in the water resources field and are recommendatory for state and local planning 321/. These guidelines cover in considerable detail the formulation, analysis, and reappraisal of alternative plans 322/. The Principles and Standards lay down four tests to be applied in formulating alternative plans: (i) acceptability (in the sense of public acceptance and compatibility within known institutional constraints); (ii) effectiveness (i.e., technical performance); (iii) efficiency (the given alternative should be the least cost means, considering all adverse effects, of achieving specified components of the overall objectives); (iv) completeness. This last test may require relating the water and land resources plan to other types of public or private plans, and the rule to be followed is that, in so doing, beneficial and adverse effects must be treated comparably 323/.

A twin development to the consideration of all relevant factors and the preparation of a number of alternatives is the recognition that modern water resources planning must be continuous and evaluated as it evolves, so as to incorporate new data, correct past mistakes, and provide for new contingencies such as changes in technology and social values as they affect water demand. Until recently very little post-evaluation of policies and programmes was undertaken: one outstanding exception was the case study of the Kitakami basin project in Japan done by the ECAFE secretariat within a decade after the project was launched 324/. Yet the history of water resources development is replete with examples of programmes whose actual performance was very different from that originally planned. An instance is the Columbia Basin Project, authorized in 1933 and designed to be the largest single irrigation project within the United States, but not put into full-scale operation until nearly twenty years later. What appeared to be a favourable prospect in the 1930's became unfavourable in the 1960's, but quite promising again in the 1970's, largely through a technological development (central pivot irrigation) whose impact could hardly have been foreseen as recently as 1970. The author of an appraisal of this project urged the consideration of a formal scheme of continuous ex-post evaluation as encouraging more flexible development plans, geared to change and capable of accommodating it 325/. He noted that this "might be especially valuable in those nations with strong central control of development for it could legitimize individual departures from plan at the most timely intervals and under the most favourable circumstances" 326/.

A FAO study also came out with a strong plea for incremental planning and post-evaluation, declaring that "planning must be a dynamic process with one stage under operation, one under construction, and one under planning, simultaneously, so that the results of the earlier stages can interact favourably upon the later ones" 327/. It cited an unidentified project in which the planning headquarters was moved from the metropolis to the project area, so that by close contact and personal observation a constant feedback of success and failure information was put into the planning of the successive stages.

Ex-post evaluation, using the cost-effectiveness approach, has proved a valuable tool in Pakistan in appraisal of part of an ambitious multi-objective reclamation programme launched in 1959-60 with international cooperation and financial support 328/. The programme was aimed at eradication of water-logging and soil salinity, reclamation of affected lands, and augmentation of irrigation water, and comprised 26 separate Salinity Control and Reclamation Projects (SCARPs), of which, however, only six were partially completed by the end of 1972. Two of the evaluation study's conclusions are of particular interest. One was that most of the objectives of the public programme could have been achieved more efficiently and at much less cost by encouraging farmers to install private tubewells instead of the expensive and progressively less effective public tubewells. The other was that existing institutional arrangements for data collection, planning, operation and management criteria, and project monitoring were inadequate and needed strengthening 329/. The study raised a problem pertinent to post-evaluation under any system of water administration -whether monitoring should be under the control of the agency responsible for planning, design and execution of projects. It recommended (and this recommendation is echoed in another survey of planning 330/) that an independent evaluation board be created at the national level to carry out periodical review of all river basin development plans 331/.

IV. CONSTRAINTS ON ADMINISTRATIVE POWER - PROTECTION OF THE INDIVIDUAL AND THE PUBLIC

The growing demand for water all over the world, coupled with technical advances, has led to the emergence of consolidated water administration with tremendous power to affect the lives and rights not only of individuals but also of whole communities. Consolidation of administrative functions contributed greater efficiency in water management but, at the same time, evoked a demand for safeguards against possible abuse or plain over-zealousness. The more "visible" and more publicized of these safeguards are meant primarily to protect common values and intangible, as well as economic, interests of the public. Only secondarily can they protect an individual water user's rights. They are generally connected with any large-scale activity that may adversely affect the human environment including, of course, activities connected with water resources use and development, and they are binding on the water administration as part of general administration. In other words, they are a spill-over from general environmental law into water law. The first of these safeguards or constraints is the requirement that every major decision of the administration be accompanied by a written statement of the reasons for it and its beneficial and adverse effects. The second requires that the public be associated with the decisionmaking as early as possible. It is believed that these twin safeguards will help to harmonize development, made easier by the concentration of administrative power and technological knowhow, with the protection of a quality human environment.

These assumptions have been developed and embodied in law in the United States, and to varying degrees of intensity, in other countries, not all of them industrial. When properly geared to local conditions and the national stage of development, they have universal appeal and are capable of being generally applied. The U.S. National Environmental Policy Act (NEPA), for example, explicitly mandates a written evaluation of the environmental effects of proposed actions or projects, including water projects 332/. This evaluation has to incorporate all relevant factors and points of view. Since the act is couched in general terms, the content of the environmental impact statement has been defined and elaborated with a good deal of precision in guidelines and court cases, great stress being laid on the proper consideration of alternatives and opposing views 333/.

The assumption that the soundness of the decision-making process is strengthened and safeguarded if it is open to public participation is implied in the statutory requirement that all factors be considered, but it has been given prominence in the Council on Environmental Quality Guidelines and judicial interpretations 334/. Here, then, the participation of the public becomes a bulwark against the excessive use of administrative power. According to the Guidelines, public participation is to be encouraged at the earliest possible stage in the preparation of an impact statement and the public should be alerted to the availability of copies of draft environmental impact statements. This is the responsibility of the agency preparing the impact statement. What is more, copies of such statement must be provided without charge. The public is encouraged to present its views and criticism which have to be considered and included, if only in summarized form 335/.

Significantly, while stressing the role of the public, NEPA leaves the final decision on merits open. It stops short of appointing an ombudsman or ultimate watchdog entity. Obviously, the legislators must have felt that the existing political decision-making process would be adequate to protect and harmonize public interests and values once it had been properly infused with public opinions. Though NEPA was intentionally silent on means of enforcing the administration's compliance with its provisions, the American legal system

quickly supplied, if not a final arbiter, at least a guardian to make sure that the decision-makers do indeed get all the necessary information. Almost from the start, the federal courts assumed this role, expanding review of administrative decisions under NEPA from examination of the procedural correctness of the agency decisions to evaluation of the decisions on merit, that is, whether a proper balance was struck between the relevant factors. In this, they concomitantly enlarged the role of the public, since courts in the United States have to be activated by the parties in a real case and do not act on their own initiative or give advisory opinions. The federal courts thus made themselves directly, and the public indirectly, ad hoc final overseers in covert competition with the political decision-makers. Such dual supervision by the courts and the public was made easier by a liberal interpretation of standing to sue under NEPA. Anybody who can show a personal stake or interest in an agency's decision can challenge it before a proper federal court 336/.

This method of counterbalancing the power of the administration through the expansion of public supervision via the courts resulted in numerous suits in the United States, which were both costly and cumbersome, and were hardly conducive to systematic and orderly supervision. That is partly why, in countries such as Australia and Canada which also adopted a procedure of formal assessment of agency decisions affecting the environment, the final decision tends to be left to the highest echelon of the ministry or department, and judicial review is limited either by statutory prohibition or by statutory grounds of administration discretion, or circumscribed by restrictive interpretations of who may activate it. For example, the Ontario Environmental Assessment Act of 1975 states that:

"No decision, order, direction, resolution or ruling of the (Environmental Assessment) Board shall be questioned or reviewed in any court and no proceeding shall be taken in any court by way of injunction, declaratory judgment, certiorari, mandamus, prohibition, application for judicial review, quo warranto, or otherwise to question, review, prohibit, or restrain the Board of any of its decisions, orders, directions, resolutions or rulings 337/.

Nevertheless, in both countries public participation is allowed to exert a mitigating or restraining effect on the administration. According to Australian law, the Minister must, if so requested, publish information about projects that may have adverse environmental effects. There is no duty, as in the United States, to do so as a matter of course 338/. In Ontario, Canada, the public is informed when an impact statement has been prepared and then can submit written comments 339/. This is a more limited access to the decision-making procedure than in the United States, where the public is associated with the process of assessment itself.

The new Colombian Natural Resources Code provides for public participation in the assessment process through the promotion of environmental protection associations. These are like water users' associations writ large, since they may include inhabitants of an area in the character of users of the environment as a whole 340/. In many countries, however, the traditional users' associations remain the most important forum of public participation in the management of water resources. By replacing or supplementing the water administration at the local level they diffuse the impact of administrative decisions and help to harmonize local interests with the larger national interest. They achieve the needed decentralization, even where this is not formally provided for. Many of them have power to construct, operate and maintain works, supply water, and raise funds and, in addition to supervisory duties, some perform judicial functions in the settlement of disputes 341/. In Salta Province, Argentina, for example, the Water Code of 1946 empowered the inspectors (chairmen of the boards of users' associations) of a river basin or major canal to form a board which had power to decide disputes between association members 342/. This was not very different in essence from the organizational set-up in the Subak (customary water management system) of Bali, Indonesia, thus demonstrating the universal applicability of this most basic level of water administration. The community of irrigators

within the Balinese Subak, like other users' associations elsewhere, has control over water management and waterworks within its area, and its elected chief water master acts as arbitrator in the settlement of disputes 343/.

Judicial protection of individual rights, at least against abuse by other users, is afforded in another instance by the famous water tribunal of Valencia, Spain. This tribunal is composed of the presidents (syndics) of eight communities or irrigators which make up the Vega of Valencia. They are elected by the members of the communities they represent, and remain in office two or three years. Any one of the syndics can make a preliminary investigation when he is apprised of an infraction of a community ordinance (each community has its own ordinances) and can summon the persons affected to the tribunal, which meets every week. The procedure before the tribunal is oral, swift, and inexpensive, and there is no appeal against the verdict. The efficacy of the system is attested to by the fact that sentences are, for the most part, voluntarily complied with; forced execution, by suspending water supply to the defendant or confiscating his goods, is very rare 344/.

It must be noted, however, that users' associations in most parts of the world are under the close supervision of the state or provincial authorities 345/. Though they may act as a tribunal of first instance and frequently have a consultative role, their individual impact upon major regional and national decision-making is relatively slight. Users may have a more direct influence on the decisions of the administration itself where they are actually associated with the state administration. This is the case with the English regional water authorities, whose membership must be so framed that the total number of appointees of the administration is always less than the number of those appointed by local authorities. The latter figure is determined by population size and density - a metropolitan county may appoint two members, a non-metropolitan county one, if, in either case, a quarter or more of the county's population resides within a water authority's area. Similarly, the districts within a metropolitan county may between them be represented by two members, those of a non-metropolitan county by one member 346/.

The government's explanatory memorandum issued prior to the 1973 reorganization emphasized that if the regional water authorities were to be fully capable of discharging their new and complex responsibilities, the total membership of each should be considerably smaller (hence, less broadly representative) than that of the more numerous river authorities which preceded them. The memorandum did, however, intimate that it was proposed to set up within the area of each water authority one or more consumer councils reflecting sectoral interests of major users, stating that:

"It is envisaged that the Regional Water Authority will be required to report annually to the consumer council on its plans; and to consider, and reply to, comments by the council on these plans and on other matters affecting consumers' interests. If the council is dissatisfied with the' reply it will have direct access to ministers 347/." (emphasis added)

Similarly, the French basin committees, which give advice to basin finance agencies on all matters dealt with by the 1964 law, are in part representative of the different categories of users, representatives of the local communities in a basin, and administrative appointees. The user representatives are also, in a sense, administrative appointees, since their names are forwarded to the Minister for Quality of Life for appointment order, but they are designated by sectoral organizations such as the National Council on River Navigation, the National Tourism Union, the Professional Union of Water Distributors, or by groups of organizations, such as regional chambers of commerce, agricultural associations, fishing federations, and regional management societies. Representatives of local authorities are elected. These basin committees are bigger bodies than the English water authorities and provide for a wider representation of interests; their basin functions are also different, pertaining chiefly to planning, advice on the resolution of intra-basin disputes, and approval or disapproval of effluent charge assessments 348/.

The prototypes of such representation are to be found in the Genossenschaften of the Ruhr. The assemblies of the Genossenschaften, which are much larger bodies than the British or French basin entities, represent both the beneficiaries of pollution control and water supply and those who pay for these services, in industry, business, mining, and rural and municipal districts. This representation may be distributed in a fixed number of seats for each user group (as in the Brober Erfterverband), or proportionally to their financial contribution through charges (as in the Ruhrverband, Ruhrtalsperrenverein, and Emschergenossenschaft), or may be artificially limited to curb monopoly control by a single financially dominant group (as in the Lippverband, on which mining interests cannot have more than forty per cent of the voting power) 349/.

The individual water user is, of course, still directly protected against administrative encroachment by the general requirement that water rights applications be publicized before they are issued and by the recourse afforded by the legal system. The former has always constituted a partial means of protection from administrative decisions which the environmental impact statement has simply enlarged to incorporate intangibles and a more comprehensive representation of elements affected by such decisions. The procedural steps involved usually comprise notice of application published in a newspaper, but may or may not involve a hearing. Applications are often required to be accompanied by plans, drawings, and specifications indicating such details as the source of water supply, the point and means of abstraction, methods of measuring, amount of water required, land on which it is to be used, purpose of use, and place of return (if the water is to be returned to the source) 350/. Objections to the application can then be filed with the appropriate authority within a prescribed period of time 351/. The holding of a public hearing may be at the discretion of the administration, as in Kenya, or may be obligatory if the application is protested, as in California law 352/. Under French law, a hearing is almost always required if the projected works are apt to alter the regime of the waters, and, in the special zones provided for in the Law of 16 December 1964, a public hearing outlines conditions of use and the application may be refused if the projected diversion is a hindrance to general administrative plans for the zone 353/.

The recourse afforded the individual water user by the legal system varies quite widely. In some countries, such as Poland, recourse from administrative decisions is limited to the administrative hierarchy 354/. This applies also in England and Wales to appeals from administrative decisions under the 1963 Water Resources Act 355/. In other countries, the matter is handled by administrative tribunals, as in France 356/, or special water tribunals, such as those in Spain, Chile, Argentina, Italy, South Africa and Israel, to the exclusion of the general courts 357/. In common law countries, such as Canada and Australia, on the other hand, recourse goes to the general courts. Whether to administrative tribunals or courts, however, recourse is usually limited to those who have suffered direct and, as a rule, pecuniary damage. The enumeration given recently by the Ontario Court of Appeals may well serve as an illustration of the type of damage for which recourse is had:

"It would be tempting to say that a member of a conservation authority has a 'special interest' or 'sufficient interest' to give him necessary status, but a very long line of cases, binding on this court, have held that the 'interest' referred to must be pecuniary, or proprietary in nature (including, of course, actual physical injury or the risk thereof) 358/." (emphasis added)

This restricts the role of the public in controlling the effects of an administrative decision once it has been made. By contrast, courts in the United States, under the impact of environmental concern, have enlarged the circle of persons who can challenge administrative decisions on environmental grounds to all who can show a mere personal stake or interest in the decision 359/. It may be that the circle of persons who have standing to challenge administrative decisions on environmental grounds will be enlarged in other countries, thus

enhancing the role of the public and imposing new constraints on the administration. In Canada, to give one example, there seems to be a mounting pressure to follow the United States and adopt a similar law on standing 360.

While it is definitely contributing to mitigation of administrative power, environmental concern is helping, perhaps incidentally, by furthering administrative consolidation in each natural resource field, to create conditions for both a vertical and horizontal concentration and increase of that power. However, it is conceivable that a consolidated water resources administration of this type may be able to use its enlarged powers for better harmonization of the developmental and conservation requirements of the national economy, because, even though this may not be formally mandated, such a consolidated administration cannot help but take into consideration, as a matter of routine, the various interests that are affected by its decisions.

V. FLEXIBILITY AND EFFICIENCY IN MEETING WATER DEMAND FOR IRRIGATED AGRICULTURE

The explicit or implied goal of the legal and administrative responses to increasing demand for water is to stretch the work that the limited amount of water can do as far as possible and see to it that the work is done in the right place and with the least possible environmental damage. Irrigated agriculture is still the prime consumptive user of water and, therefore, the most important index of the impact on efficiency of the structural and functional consolidation of water administration. One of the more important results of the ascendancy of the administrative system has been that the water administration is taking over irrigation water supply, which becomes less and less an individual enterprise. Where water is a scarce commodity and must be conveyed over long distances, irrigation projects are beyond the means of individuals or even groups of users. Water administration then assumes responsibility for the construction of works and the distribution of water. These tasks may be carried out by regular government departments or by special entities, and the users' associations are relegated to maintenance of minor canal systems 361/.

In special areas it seems to be the rule that the works are constructed and the water distributed by the administration, and it gains control, in some instances, over the use of land also. The responsible government agency may exercise control right down to the individual holding, as in South Australia 362/, or may provide an incentive to the landholder who is using efficient techniques by permitting him to irrigate a larger amount of land than the norm, as in Chile under the 1967 Land Reform Act 363/. In Indonesia, for example, the tertiary and smaller canals are built by the users. The survey and design of the smaller canals are done by the government, however, whose policy it is also to construct the first 30 to 50 meters as an example and to provide technical assistance where necessary 364/. In the Kitakami Special Area the central government (represented by the Minister of Agriculture) was made responsible for the major projects and the two prefectures for the minor ones 365/. The National Company for the Rhône, in a special agreement with the Secretary of State for Agriculture, operates the main works and canals as concessionaire, and may itself distribute water or have this done by the users' associations 366/.

Where government is the builder of works and supplier of water, it can and does set specific conditions for efficient use. Thus, the Colorado Basin Project Act requires that, by the terms of each contract for water supply under the Central Arizona Project, the canals and distribution systems through which the water is conveyed after its delivery by the federal government to the contractor be lined to prevent excessive conveyance losses 367/. Similarly, lessees of lands in government irrigation areas of South Australia must line their irrigation channels with concrete when required, and must drain their blocks effectively so as to prevent seepage onto other land 368/. However, where users or users' associations are responsible for the upkeep and repair of irrigation works, efficiency depends to a great extent on the diligence of local officials 369/.

Some statutory provisions which appear strongly worded are really of a rather general nature. For example, the RSFSR Water Code exhorts users to use water efficiently and to concern themselves with the economic consumption of water and the restoration and improvement of water quality 370/. The RSFSR Law on Nature Conservation requires all organizations whose activities affect the water regime to use sources of water without exceeding the established norms and to use irrigation, subsoil and artesian water with care, permitting no unproductive consumption 371/. General provisions of this nature are sometimes predicated upon existing average levels of performance. They give no spur or initiative to

improvements beyond the norm in the efficiency of irrigation systems. The Burma Canal Act, for instance, speaks of "proper customary repair" 372/, and one of the major weaknesses of the prior appropriation system in the western United States has been the refusal of the courts to apply other than the standards used in the past and the general custom of the locality 373/.

Determining the amount of water to be allocated to individual users is one of the most important factors in efficient water use, and becomes a major task of the administration. Quantity expressed as a share of the total supply is a feature of the riparian rights system, and the amount is specified by the courts rather than by the administration. It leaves the individual user little initiative to economize, since water saved cannot be used outside riparian land. In the prior appropriation system, where the amount of water is measured by the requirement of beneficial use to which water can be put 374/, the role of the administration is limited. Theoretically, the concept has the specific objective of preventing waste, but in practice it may impose too rigid limits on the amount needed.

Calculations of quantity which are based, not on a simple volumetric figure per hectare or per acre, but upon a number of factors together, may be better suited to efficient determination of the amount of water needed for a particular purpose, but they require and presuppose the strong intervention of the administration. Frequently, they are set out in the rules and regulations governing individual irrigation projects under which water distribution plans are established at the beginning of each crop season. These laws and regulations may require the administration to take into account such factors as the length of the growing season, the type of crop grown, its precise water consumption in each unit of land, and variations in streamflow from month to month 375/. They give the administration more flexibility in allocating water, provide more scope for the introduction of water-saving techniques, and allow the user more incentive to economize than laws which set a rigid amount per unit of land.

Insistence on, and the supervision of, technological improvement in efficiency of use also require closer control by the administration, but the evolution of law in this direction is only gradually gaining ground. Many statutes simply make allowance for conveyance losses, seepage, and evaporation, without putting any premium on the elimination of waste 376/. General prohibitions on wasteful use are of little effect, and fines, threats of imprisonment, and even loss of right merely serve to bring gross wastefulness down to permitted levels of consumption. Some newer statutes, however, in jurisdictions where administrative control is quite strong impose the obligation to install metering devices for use of surface waters, and quite a number mandate them for groundwater abstraction 377/.

Tax exemptions and similar incentives for investment in irrigation works, such as are provided for in El Salvador's 1970 Irrigation and Drainage Act, encourage the use of new technology 378/, and so do loans and cost-sharing arrangements like those outlined in the U.S. Bureau of Reclamation, Rehabilitation and Betterment Programs, the Rural Environmental Assistance Program, and the Farmers Home Administration Program 379/. Such arrangements sometimes break down, however, precisely at the point where technical improvement is most needed - on the individual land holding. This may occur either because, as in Spain, assistance is available only for principal works 380/, or because, as in the prior appropriation system, the irrigator cannot use the water he has saved on his own land or sell it to others 381/.

Even under the most modern methods of irrigation, not all water is consumed on the spot and there is some return flow. Under less efficient conditions this return flow can be quite considerable.

Generally in the western United States waste and return water can be recaptured by the landowner before it reaches the stream, but when the return flow is due to normal operation under customary diligence and according to the established practice of the locality it cannot be stopped. Wyoming, for example, by statute makes any change in use conditional upon its not decreasing the historic amount of return flow 382/. The U.S. National Water Resources Commission, in its 1973 Report, urged a revision of the system so as to permit complete recapture of return flow and allow the user to do whatever he wishes with the recaptured water, even to sell it 383/. This would be not unlike the existing regime of return flow in Latin American countries where, although the users of return flow must obtain permits from the administration, these permits are valid only as long as the water is available. They are the first to be curtailed in time of shortage and as a rule are given for a definite term 384/.

The achievement of economy and efficiency in irrigation water use must, however, be weighed against the likelihood that it would bring about a redistribution of supply, a redistribution of priorities among users, and the partial or total extinction of some water uses. This is particularly true where return flow contributes substantially to groundwater recharge and where its disruption might have repercussions throughout an entire hydrologic system. It is more than ever essential that the management of surface and groundwaters be coordinated and that the proper assessment procedure be institutionalized to encompass consideration of all the potentially adverse as well as all the potentially beneficial effects of a project.

Under ministerio legis systems, water is often made appurtenant to particular pieces of land: for example, under the riparian rights doctrine it is tied to riparian property. In some of the earlier administrative systems, also, water remains appurtenant to land, as is the case with intuitu rei concessions in South America, which are automatically transferred on sale of the land 385/. In the more mature administrative systems, the water administration assumes control over transfer of right from place to place and from purpose to purpose. Such power is greatest when the sole criterion guiding the administrative agencies is the broadly stated one of public interest or public policy. This obtains in jurisdictions where the water administration can vary or even withdraw licences for water use when the public or social interest warrants it 386/.

Another result of the increased administrative control over irrigation is shown in the granting of permits for a definite period instead of permanent concessions, in the reduction of time which must elapse before a right can be revoked for non-use, and in the power to abrogate or revoke a concession in order to achieve more efficient water management and use 387/. Failure to use water is perhaps the most frequently stated reason for loss of right in all systems of water law except the riparian rights system which, as a general rule, does not recognize either abandonment or forfeiture of right. The length of time which must elapse before a right can be revoked for non-use is a measure of the permissiveness of the law: it varies from twenty years or even longer in older systems, such as the Spanish law, to two years in the newer codes of Chile, Poland, and Peru 388/. A great number of laws provide for suspension of right for inefficient use of water, either through excess consumption or through neglect in maintaining irrigation works and ditches 389/. This is perhaps the most powerful penalty that can be invoked. Fines and even imprisonment are specified in some statutes, but to what extent such penalties are a deterrent depends on their severity and on the ability of the water administration to enforce them diligently.

Failure to observe the conditions of the authorization is generally a ground for revocation of right, but in the water legislation of many countries the specific reasons are left to the water administration. When, however, the administration is granted a general discretion to revoke or vary a license for reasons of public interest or to fulfill a plan 390/, the apex of flexibility is reached. This might apply particularly to circumstances in which the introduction of new techniques brings about a broad redistribution of water supply, and it requires safeguards against abuse of administrative power.

Finally, as the response to growing water demand leads in agriculture to greater administrative control of water supply, it fosters the proliferation and, perhaps, also the enlargement in size of users' associations, as a counterpart to the growth of the water administration. Since water now is increasingly supplied from publicly built and publicly maintained works, the water administration finds it more efficient and economical to deal with large associations or even groups of association than with the individual user. Through these associations, the voice of the individual user as to where and how the resource is to be ultimately used acquires more weight.

VI. TRENDS IN INTERNATIONAL WATER LAW

It has been noted that the increasing demand for water, has brought about on a national level consolidation in the administrative structure within the river basin and in some instances within regions larger than the basin. It has also generated a need for flexible management in which all the waters of a region or of a whole nation, depending on the size, are treated as one pool from which different uses are satisfied interchangeably, not according to rigid rules, but according to preferences consonant with public interest.

The integrating tendencies which make for more efficient use of water within the national borders operate also within the politically divided basin. Here the pull of geographical unity has been reinforced by the realization that damage caused by a beneficial use or a harmful effect of water does not stop at the watershed or political boundary. It is the steadily though slowly growing capacity to inflict damage at ever-increasing distances through water use and exploitation that has forced a cooperation between co-basin states and may eventually lead to the obliteration of differences between the rules that govern water use and exploitation within state borders and those that pertain to the transfrontier effects of such use.

International water law developed initially in relation to frontier waterways where the interdependence of water was first and most intimately felt. The need for protection from injury was experienced so strongly that states began to conclude treaties which, as a rule, limited their free use of transboundary waters in the frontier zone. These treaties placed a heavy obligation on the party states to maintain boundary waters in a natural condition and not to make any alteration in the flow, bed, or banks (including diversion of water), without the consent of the governments concerned. Among them are the Prussia-Netherlands treaty of 1816, the Belgium-Netherlands treaty of 1863 concerning the Meuse, the Switzerland-Baden agreement of 1879 on Rhine navigation, and the Additional Act of 1866 to the Franco-Spanish boundaries treaty of 1856 391/. With the increase in scale of water exploitation, the area and scope of boundary waters treaties enlarged until it began to be felt that they should pertain to the whole river basin. In the short span of two years, from 1959 to 1961, treaties were concluded concerning three major river basins, Nile, Indus and Columbia. They represent the two major principles of international water law: that of equitable apportionment and that of joint management exploitation.

The 1959 agreement between the United Arab Republic and the Republic of the Sudan for the joint development of water resources in their sections of the Nile basin, embraced an area which had been politically united in the past and in which, since the close of the 19th century, the interdependence of surface waters had been protected by international agreements, agreements that the Sudan, however, felt were too restrictive. The 1959 treaty acknowledges the Sudan's claim to a voice in Nile basin development and coordinates the projects of the two countries, guaranteeing each a measured quantity of water and providing for a proportionate reduction in the share of each in the event of a future allocation of water to upper riparians in the basin 392/.

The Indus Waters Treaty of 1960 pertains to an area in which the flowing waters had long been used and developed as a unified system under one political control. When this area was politically divided, the plan of the International Bank for Reconstruction and Development, proposing an apportionment of the basin's waters according to geographical location, became the basis of the agreement. Each party is under an obligation not to interfere with the flow of waters assigned to the other party (except for specified uses).

The treaty declares that both parties have a common interest in the optimum development of the rivers and establishes a permanent commission for study, exchange of information, and inspection 393/.

The Columbia River Treaty of 1961 represents the second major principle of international water law, that of joint management and exploitation. Prior to that time, both parts of the basin had been developed separately, and unequally. The general philosophy embodied in the treaty is that cooperative projects should result in greater advantage to both parties than individual alternatives available to each, and that a country should share in the power produced by its storage facilities in another country and should be rewarded in some ratio to the value of flood damage prevented by this storage (the downstream benefit theory) 394/.

Along with the evolution of water treaty law, efforts intensified to give precision to the vague general principles that pertained to and were considered to govern the use of politically divided waters, that is, the principles of neighbourliness and abuse of right 395/. This was attempted initially by regional conferences in which, however, waters were only one of many concerns, and later and more effectively, perhaps, by international legal associations. The Declaration of the Interamerican Conference held in 1933 in Montevideo swung the pendulum too far and too fast from the principle of absolute national sovereignty over water resources and, in a manner reminiscent of the early frontier treaties, flatly forbade without consent any alteration that might be injurious to waters under the jurisdiction of other countries 396/. This giving of a veto power to the co-riparians did not reflect the current state of international law, and was rejected by the Arbitral Tribunal in the Lake Lanoux case, the most cited opinion on international waters in recent years. By stating that, in the absence of specific obligations imposed by agreement, all that international law requires is to take into account the interests of the other riparians, the Arbitral Tribunal reflected correctly the degree of cooperation postulated by international law 397/.

Neither the Montevideo Declaration nor the opinion in the Lake Lanoux case defined the extent of rights and benefits of each co-riparian. This was done by the International Law Institute in 1959 and, later, by the International Law Association in 1966. Both base on equity the sharing of the use of waters and cooperation in joint development. The Salzburg Declaration of the Institute states that:

"Every state has the right to utilize waters which traverse or border its territory..."

and

"If the States are in disagreement over the scope of their rights of utilization, settlement will take place on the basis of equity 398/. "

The International Law Association was more precise in its Helsinki Rules and put more emphasis on the drainage basin in saying that:

"Each basin state is entitled, within its territory, to a reasonable and equitable share in the beneficial use of the waters of an international drainage basin 399/."

Further development in international water law came, as it did in municipal water law, under the impact of environmental concern. The growing scale of water projects brought about the realization that water exploitation also has detrimental effects which may sometimes outweigh the benefits. At first, concern was limited to the evolution of rules for the protection of waters themselves from pollution, and its most significant expression was in the requirement for the formulation of standards in treaties dealing with water pollution.

A recommendation to establish standards appears already in the 1950 report of the International Joint Commission (I.J.C.) on the pollution of the Connecting Channels of the Great Lakes 400/. After that, provisions relating to standards occur more frequently in international conventions. For example, the 1963 Convention on Pollution of the Rhine empowers the Rhine Commission to recommend protective measures, and in 1972 the parties to the Convention specifically instructed the Commission to draw up a list of prohibited substances 401/. While these instruments merely postulate the establishment of standards, the 1972 U.S.-Canadian agreement on the Great Lakes pollution, which was reached after several years' investigation by the I.J.C. and lengthy negotiations, actually sets elaborate standards or purity objectives for different pollutants as well as for different activities, and obligates the parties to implement these objectives through national legislation 402/.

When rules were developed for the protection of the environment as a whole, they became applicable to the effects of water resources development on the environment outside the jurisdiction of the state in which the works are located. First of all, international environmental law reinforced the requirement of prior notice concerning water works which may have transfrontier effects, on the premise that it is important to prevent the detrimental impacts, instead of mitigating or alleviating the damage after it has been sustained. The requirement of notice was clearly stated in the preparatory documents for the Stockholm Conference 403/, but dropped its obligatory character and emerged as a watered-down recommendation in the final text 404/.

What was lost in the Stockholm formulation of the duty of notice was regained later in the obligatory wording of two United Nations General Assembly resolutions. Both the resolution on Cooperation in the Field of the Environment Concerning Resources Shared by Two or More States and the resolution which embodies the Charter of Economic Rights and Duties of States treat notice as an obligation and a duty 405/.

Another contribution of international environmental law lies in the development of rules concerning the requirement of an environmental impact statement. This is still an evolving area of law, but the need for a thorough assessment of any transboundary environmental effects of projects begins to be firmly recognized. Again, the spur was given by the Stockholm Conference. The language of Recommendation 61 is close to that of the U.S. National Environmental Policy Act (NEPA) and urges:

"... that the Secretary-General, in cooperation with governments concerned, and the appropriate international agencies, provide that pilot studies be conducted in representative eco-systems of international significance to assess the environmental impact of alternative approaches to the survey, planning and development of resource projects 406/."

The Stockholm recommendations do not presume to give anyone a right of approval or disapproval, but neither does NEPA. In case of substantial damage, however, the responsibility of states is established by Principle 21 of the Stockholm Declaration which crystallizes principles of international law in this respect as follows:

"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 of areas beyond the limit of national jurisdiction 407/."

Principle 21 established state responsibility rather generally and vaguely still, and by itself does not add much to rules of international water law. But responsibility was further elaborated in 1974 in the OECD Recommendations concerning transboundary pollution and in the Nordic Convention between Sweden, Norway, Finland and Denmark 408/. The OECD Recommendations advocate the right to sue on a non-discriminatory basis in the state where the pollution originated and the Nordic Convention actually prescribes such nondiscriminatory right to seek redress before the courts and administrative agencies of the country from which the pollution comes 409/.

So far, the impact of environmental concern and of environmental law has been less on international than on national water administration. Nowhere as yet have any joint environmental agencies emerged. The T.J.C., established in 1909, when international water law was in its infancy still remains the model of a successful international water commission. Its most important power, under the Boundary Waters Treaty, has been regulatory, to give or withhold consent for projects in boundary and certain other waters and to issue orders binding on both parties in cases of diversion and obstruction affecting boundary water levels and flows 410/. Article IX of the Treaty also gave the Commission the responsibility for investigation and recommendation, but only with respect to specific problems referred to it by the two national governments. Though some of these references have been extremely wide-ranging and important (e.g., the 1964 Pollution Reference), and the Commission's investigations have been highly influential, it lacked until recently independent recommendatory power and initiative. This power was acquired in the 1972 Great Lakes treaty, which gives the Commission authority to recommend legislation and programmes, to supervise the effectiveness of government pollution control measures, and to coordinate these activities, though it stops short of granting the Commission enforcement authority 411/.

Similarly, the Committee established in 1957 by the four co-basin states of the Lower Mekong 412/ for coordination and investigation of the resources of that basin was empowered by its statute to "prepare and submit... plans for carrying out coordinated research, study and investigation" and to "draw up and recommend to participating governments criteria for the use of the water of the main river for the purpose of water resources development" 413/. These powers of initiative and recommendation were greatly amplified in the four governments' Joint Declaration for Utilization of the Waters of the Lower Mekong Basin, adopted on January 31, 1975 414/. According to Article 7, the comprehensive plan prepared and approved jointly by the Committee becomes the basis for the basin's water resource development. In addition, the Declaration provides for each co-basin state's equitable share in the utilization of the basin's water resources (Articles 5 and 6), thereby implementing the Helsinki. Rules. It also includes the duty of notification which, in the comprehensiveness of information required, may amount to an environmental impact statement (Article 17).

The powers of the international administration have also been strengthened in the Senegal Basin. There, after a more or less abortive initial attempt at basin organization in 1963, a new entity was established in 1972 whose decisions become binding obligations upon the three member states, Senegal, Mauritania, and Mali. This is the Organisation Pour La Mise en Valeur du Fleuve Sénégal (OMVS) 415/. Its chief decision-making organ is the Council of Ministers (although the Conference of Heads of State, which establishes general policy, is the highest decision-making institution and its decisions are also binding on the parties). Perhaps the fact that the Council is composed of cabinet-level officials is the real source of its powers. It can authorize projects, define priorities for development, arrange for financing, and apportion the fiscal responsibilities of Member States, and its president may represent the Council in relations with international or national lending institutions and negotiate and sign treaties in the name of the Member States. All this can be done without the time-consuming and often frustrating process of referral to national legislatures for approval, and the Council has already made a number of decisions strengthening its managerial role: that a permanent interstate commission be created under the OMVS Secretariat-General to regulate and control water utilization, that works of common interest shall be in the joint ownership of the Member States, that the

management thereof shall be vested with specialized interstate or mixed agencies, and that the three Member States shall jointly and severally guarantee related construction costs 416/.

The ability of an international water resources entity to make decisions which are just as binding upon Member States as if they were incorporated in duly ratified separate treaties may mean that the example of the European Economic Community, in which the Council of Ministers can take binding decisions, created an historic precedent which is now being elaborated at the river basin level. If so, it is an important and fortunate development. It may be that, on the international plane, a more efficient administration will emerge generally, with the power to forge an appropriate tool for the flexible management of water resources within international basins with due consideration for the identity of the basin states and for corresponding environmental impacts 417/.

VII. CONCLUSION

Since the turn of the century, water law doctrine and practice have been developing principles and rules that would enable water administrations to cope more adequately with the fast-growing demand for water. The new approaches were admittedly piecemeal and far from systematic, but they were generally designed on the one hand to strengthen the water administration so as to maximize the development of water resources, and on the other to find means for protecting individual water rights, as well as the public interest, which might conflict with such development.

As a first step, administrative control was gradually extended over all waters. The vehicles for this extension were the principle of public domain, in civil law countries such as France, and the principle of public ownership, by the state, as in some new water codes, by the state in trust for the people, or, simply, by the people or the public, as in some states of the United States. Whatever doctrinal shades of difference there may be between these principles, they all served as a means of eliminating private waters and also inconsistent permanent and exclusive private water rights. This is well illustrated by the drastic shrinkage, all over the world, of riparian rights, which were based on private ownership of abutting land and exhibited the character of permanency. The elimination of inconsistent rights, while necessary for efficient management of water resources, may work hardship on their holders who relied on them in good faith. To mitigate such hardship, modern water codes permit a grace period wherein the old rights are transformed into new ones; the latter, as a rule, are accorded only for a limited number of years, with the possibility of renewal. This is one of the most important tenets of efficient water administration.

Parallel with gathering all waters under the administrative umbrella, including groundwater which was the last to be subjected to a permit system, went the consolidation of the administrative structure itself. Water administration became resource-oriented instead of use-oriented. This meant that separate administrative departments in charge of particular water uses, such as irrigation, domestic water supply or power, which had been scattered among several different ministries, were at least coordinated if not, sometimes, united under one agency or ministry. When the unity of the hydrological cycle became better understood, this consolidation was seen as obviously the correct approach toward enhancing the effectiveness of water administration and, if pushed to its logical conclusion, should include the management of atmospheric waters as well.

Administrative consolidation is best shown at the level of the river basin. There is no mystery in this, because the river basin is the most obvious natural entity for water management and the unity of its water system, including groundwaters that drain into the common outlet, tends to impose a concomitant unity on water administration at this regional level. The suitability of the river basin as the basis for effective use and development of water resources was already perceived at the turn of the present century, and led to somewhat exaggerated claims on its behalf. Consolidation of administration, in the form of valley authorities, was pushed too fast and too soon and the authorities assumed administrative tasks, including the development of non-water resources, that were so comprehensive as to hinder the administration from being effective in water management.

On a more modest scale, the river basin unit of administration still plays an important role, one which has "been revitalized to a great extent by the growing concern over water pollution control, for which the river basin is the obvious natural management area. Basin-wide agencies have been created with comprehensive powers over the use and development of all waters of the basin and are particularly effective in planning at this level. The river basin has long been recognized as a self-contained component of water planning and, while basin plans must be coordinated at the national level, they should and do possess a considerable autonomy. The national plan builds on the basin plans, assigning development priorities between individual basins and harmonizing non-basin water development with them. While the river basin is a natural unit for water planning and use and, therefore, should be utilized for that purpose as widely as possible, it does not mean that man-made units should be excluded. To the contrary. Experience shows that in certain circumstances, such as when water must be supplied to a large metropolitan area, the most effective, perhaps the only effective solution may be to combine several basins or parts of basins under one management. The sole requirement that must be observed is to evaluate and assess the consequences of non-basin water management on the river basins affected by it. This can be fulfilled by the practice of incremental water planning and careful ex-post evaluation, so that any mistakes may be corrected or at least mitigated.

The consolidation and flexibility of water management have gone furthest at the present state of the art in so-called conjunctive management of waters. This transcends the separate administration of different types of water, ground, surface and atmospheric - even when performed by the same agency - and substitutes for it a truly integrated system in which all the waters of a basin or a region are treated as a common pool to which rights are assigned as a whole, not to different types of water, and in which, for example, shortages of surface water can be compensated for by the use of groundwater and vice versa without derogating from established rights.

The response to growing demand on a limited supply of water, thus, has been to regard all waters within a basin or region as one undifferentiated whole and treat them accordingly, while at the same time consolidating the structure of the administration itself, especially at the river basin level. This has given water managers the needed power and flexibility to maximize water utilization. It may not be so successful, however, in promoting harmonization of supply and demand, particularly on a local scale, and harmonization of the need to maximize water utilization with the need to protect other social interests, such as recreation or the environment. To overcome this possible imbalance, the public has been associated to varying degrees with the administration in planning and policy-making. The institutionalizing and strengthening of users' associations, together with the requirements of adequate notice and publicity in processing permit applications are evidence of the protection of individual and local interests which might otherwise be given insufficient weight in the context of overall management of water resources. These procedural requirements are the forerunners of the environmental impact statement, which has emerged as a vehicle for harmonizing water resources development with protection of the environment. By marshalling all relevant factors and by discussion of alternatives to a proposed project or projects, the environmental impact statement should permit the decision-makers to make a rational decision without prejudging a problem.

Parallel with these developments in municipal law, international law is groping for more efficient forms of international water administration. Here, there is much less consolidation, though some of the existing river commissions or river basin commissions have been strengthened by being accorded the right to make proposals and suggestions to the governments concerned. They may gradually be given power to make binding decisions without referral to governments for approval in each case; the prerequisite to such a development would likely be that governments be represented on these commissions at a ministerial level, instead of at a subministerial level, as they usually are now.

FOOTNOTES

- 1/ United Nations, ECOSOC, Concise Report on the World Population Situation in 1970-1975 and Its Long-Range Implications (Population Studies No 56) (ST/ESA/SER.A/56)(1974), p.7.
- 2/ United Nations, World Food Conference, Rome, 5—15 November 1974, Assessment of the World Food Situation Present and Future, Item 8 of the Provisional Agenda (E/CONF.65/3), text in J.W. Willett, ed., The World Food Situation: Problems and Prospects to 1985 (1976), vol. 1, p.180, at p.213.
- 3/ Ibidem, Item 9 (E/CONF.65/4), Willett, p.289.
- 4/ Concise Report on the World Population Situation, supra note 1, pp.32-36.
- 5/ Trends in Community Water-Supply Situation in Developing Countries (WHO Member States), 1962-1980, WHO International Reference Center for Community Supply, 1973, as reported in F. van der Leeden, ed., Water Resources of the World: Selected Statistics (1975), p.484, fig. 7-11.
- 6/ United Nations, Department of Economic and Social Affairs, The Demand for Water (Natural Resources/Water Series No. 3)(ST/ESA/38)(1976), p.5.
- 7/ Food and Agriculture Organization, Water for Agriculture (E/CONF.70/11), paper prepared for United Nations Water Conference, Mar del Plata, March 1977, Rome, 1976, p.13.
- 8/ World Food Conference, Report (E/CONF.65/20)(1975), Resolution VII (4), text in Willett, supra note 2, vol. 1, p.469.
- 9/ U.S. Department of Agriculture, Economic Research Service, The World Food Situation and Prospects to 1985 (Foreign Agricultural Economic Report No. 98); see Willett, supra note 2, vol. 1, p.82.
- 10/ Talmud Bavli, Nedarim, 80b, quoted in A.M. Hirsch, Water Legislation in the Middle East, American Journal of Comparative Law, vol. 8 (1959), p.172.
- 11/ See D.A. Caponera, Water Laws in Moslem Countries, (F.A.O. Irrigation and Drainage Paper 20/1)(1973), p.21 (Sunnite doctrine).
- 12/ Ibidem, pp.31-35.
- 13/ See L. Teclaff, Abstraction and Use of Water: A Comparison of Legal Regimes, (United Nations, Department of Economic and Social Affairs)(ST/ECA/154) (1972), p.46.

- 14/ Arta. 206, 207 of the Coutume de Normandie, quoted in Daviel, Traité de la Législation et de la Pratique des Cours d'Eau, vol. 2 (1845); Statutes of Piotrkow, 1447t Collegium Varsoviensis Scholarum Piarum, Leges, Statuta, Constitutiones Privilegia Regni Poloniae Magni Ducatus Lithvaniae, vol. 1 (1732), p.151 ; also Helcel, Starodawne Prawo Polskiego Pomniki, vol. 2, No. 4356 1870), p.872. The maxim "aqua currit..." is quoted in S. Wiel, Running water, Harvard Law Review, vol. 22 (1908-09), p.190, at p.195.
- 15/ Kent, Commentaries on American Law, vol. 3, sec. 440.
- 16/ Coffin v. Left Hand Ditch Co., 6 Colo. 443, 446-47 (1862).
- 17/ Colorado Revised Statutes Annotated (1963), secs. 148-41 - 148-47 (water rights and irrigation)(repealed by L. 69, p. 1223, sec. 20); Montana Revised Codes Annotated (1964). secs. 89-810 - 89-811 (water rights) (repealed by Laws 1973, oh. 452, sec. 46). See also W.A. Hutchins, The Idaho Law of water rights, Idaho Law Review, vol. 5, No. 1 (1968).
- 18/ See, for example, Pennsylvania Coal Co. v. Sanderson, 110 Pa. St. 126, 6 A.453 (1886) where the Pennsylvania Supreme Court found that pollution of a stream by a coal mine to the detriment of a lower riparian was a permissible use.
- 19/ See L.A. Teclaff and E. Teclaff, A history of water development and environmental quality, in G.R. Goldman et al., eds., Environmental Quality and Water Development (1973), pp.46-47, and the following cases: Blaine County Inv. Co. v. Mays, 49 Idaho 776, 291 P. 1055 (1930); Enterprise Irr. Dist. v. Willis, 135 Nebr. 827, 284 N.W. 326 (1939); Doherty y. Pratt, 34 Nev. 343, 124 P.574 (1912); Empire Water and Power Co. v. Cascade Town Co., 105 F. 123 (Cir. Ct. of Appeals, 8th Cir., 1913).
- 20/ France, Instruction of the National Assembly on the Function of Administrative Assemblies, 20 August 1790, ch. VI, Lois et Actes du Gouvernement, vol. 1, p.333; Law Concerning the Decentralization of the Administration, March 25, 1852, art. 4, Table D, (1852) Bulletin des" Lois (10e sér.) pp.822, 828.
- 21/ France, Law Concerning the Regime of Waters, April 8, 1898, art. 2, (1898 Bulletin des Lois, pt. principale, t. 2 (12e sér.), p.394; see also Colin & Capitant, Cours Elémentaire de Droit Civil Français, vol. 1 (1931), p.761.
- 22/ See A.G. Spota, Tratado de derecho de aguas, vol. 1, pp. 261-63, on the Decree of March 11, 1846. Spain, Law of Waters of 13 June 1879, Gaceta (19 June 1879), Boletín de la revista general de legislación y jurisprudencia, vol. LIX (1879), p.21.
- 23/ On the German states, see Schmidt, Wasserrecht, Handwörterbuch der Rechtswissenschaft, vol. 6 (1929), pp. 788-96. For Canada and Australia, see Canada, Irrigation Act of 1906, Canada Revised Statutes, ch. 61, sec. 11 (1906); British Columbia, Water Act of 1909, Statutes of the Province of British Columbia, ch. 48, sec. 4 (1909); New South Wales, Water Rights Act of 1896, 60 Vict. No. 20, N.S.W. Statutes 1894-1897, vol. 1 (1898), p.267.

- 24/ Spain, Law of Waters of 3 August 1866, Art. 236, Gaceta (7 August 1866), Boletín de la revista general de legislación y jurisprudencia, vol. XXV (1866), p. 165. See also La Rioja (Argentina), Constitución (7 October 1949), art. 60, Anales de legislación argentina, vol. IX-B (1949), p.2435; San Luis (Argentina), Constitución, (21 June 1949)(revised), art. 32, Anales de legislación argentina, vol. IX-B (1949), p.2815; Mendoza (Argentina), Constitución (1949). art. 248; Bolivia, Law of Waters of 28 November 1906, art. 233, Anuario de leyes (1906), p.414 and appendix; Mexico, Law of Waters of National Ownership of 30 August 1934, art. 46, Legislación mexicana (1934), p.1660.
- 25/ Law No. 64-1245, December 16, 1964, art. 35-39, Code Rural, Code Forestier, Addendum 12 (Daloz 1965) gave the administration power to create a category of mixed streams in which, though they are non-navigable, the right to use and dispose of water belongs to the state.
- 26/ Teclaff, Abstraction and Use of Water, supra note 13, pp.36-39.
- 27/ Chile, Código Civil, 1855, art. 595 (Edición Imprenta y Litografía Universo S.A.-Valparaiso, 1940); Código de Aguas. 1951, Ley No. 9.909, Recopilación de Leyes por Orden Numérico, vol. 38 (1951), p.234.
- 28/ Israel, Water Law, Law No. 5719-1959 of 3 August 1959, Sefer Ha Chukkim (Israel Statutes), No. 288 (1969); Poland, Water Law of 24 October 1974, Dziennik Ustaw (30 October 1974), p.438.
- 29/ See, generally, Teclaff, Abstraction and Use of Water, supra note 13, pp.206-11.
- 30/ United Kingdom, England and Wales, Water Resources Act, 1963, ch. 38, sec. 33.
- 31/ Israel, Law No. 5719-1959 of 1959, sec. 26.
- 32/ Argentina, La Rioja, Decree Law No. 21333 of 27 August 1963, art. 296, Boletín oficial, No. 5975, supplement (27 September 1963).
- 33/ Arizona Revised Statutes, sec. 45-181 (Supp. 1975).
- 34/ Poland, Water Law of 30 May 1962, Dziennik Ustaw (1962), p.289, art. 163 (1).
- 35/ Peru, Act No. 15037 of 1964, the Land Reform Act. Art. 110 introduced a significant new condition for the recognition of pre-existing rights - that they be in harmony with "social interest".
- 36/ See supra note 24.
- 37/ Spain, Law of Waters of 1879, art. 188, Gaceta (19 June 1879), Boletín de la revista general de legislación y jurisprudencia, vol. LIX (1879), p. 21; Italy, Royal Decree No. 1775 of December 11, 1933, art. 21, (1933) Racolta Ufficiale delle Leggi e dei Decreti del Regno d'Italia, v. 5.
- 38/ United States, Iowa Code Ann. Sec. 455A.20 (1971).
- 39/ Poland, Water Law of 24 October 1974, Dziennik Ustaw (1974), p.438, art. 2.
- 40/ E.g., the annual permits issued in Australia, the eventual concessions of Spain and some South American countries, and the single-crop concessions and permits of Paraguay, India and Burma.

- 41/ See O. Tamir, Legal and administrative aspects of the water laws in Israel 10-12 (1975).
- 42/ United Kingdom, England and Wales, Water Resources Act, 1963, secs. 43(1), 44, and 46-47.
- 43/ Poland, Water Law of 24 October 1974, art. 33(1); Panama, Act No. 37 of 1962, sec. 429; Cyprus, Water (Development and Distribution) Law, Law No. 9 of 28 March 1955, as amended, Statute Laws of Cyprus (1955), p.20.
- 44/ Poland, Water Law of 24 October 1974, art. 33(1).
- 45/ Chile, Act No. 16,640 of 1967, art. 107.
- 46/ Ibidem, art. 117.
- 47/ Argentina, Salta Province, Código de Aguas, 1946, sec. 192; San Luis Province, Decree No. 813-H, 1946, art. 1.
- 48/ Kenya, Water Ordinance of 7 May 1952, secs. 98(2) and 100
- 49/ An example of pressure for the revocation of existing water rights held by individuals, if this is necessary to meet the demands of public enterprises, is given in United Nations/ECAFE, Water Legislation in Asia and the Fa East, Part I, p. 40.
- 50/ United States, Texas, Vernon's Texas Codes Ann. (Water Code), sec. 5.024 (1972).
- 51/ Canada, Irrigation Act of 1906, Canada Revised Statutes, ch. 61, sec. 11 (1906); British Columbia, Water Act of 1909 Statutes of the Province of British Columbia, ch. 48, sec. 4 (1909); New South Wales, Water Act 1912-1955, sec. 7 (1), N.S.W. Statutes 1894-1957, Vol. 12, (1958) p.187; South Australia, Control of Waters Act, 1919-1925, secs. 7 and 8 (3), Public Gen. Acts, So. Australia 1837-1936, vol. 2 (1937), p.43.
- 52/ Philippines, New Civil Code 1950, art. 504.
- 53/ Australia, Victoria, Irrigation Act, Act No. 898 of 1886, sec. 4.
- 54/ United Kingdom, England and Wales, Water Resources Act, 1963, ch. 38, sec. 24 (2).
- 55/ South Africa, Water Act, Act No. 54 of 1956 (as amended), sec. 30, Statutes of the Republic of South Africa, vol. XII (1970), p. 1201.
- 56/ United Kingdom, England and Wales, Water Resources Act, 1963, oh. 38, sec. 24.
- 57/ See, generally, Teclaff, Abstraction and Use of Water, supra note 13, pp.64-66.
- 58/ Poland, Water Law of 30 May 1962, arts. 36 (1) and 37, Dziennik Ustaw (1962), p.289. This limit is not contained in the new law of 30 October 1974, art. 49 (1) Dziennik Ustaw (1974), p.443.

- 59/ Iran, Water Law of 18 July 1968 and the Manner of Water Nationalization, art. 25. (For English translation, see United Nations/ECAFE, Water Legislation in Asia and the Far East, Part. 2 (Water Resources, No. 35), annex, pp.217-26).
- 60/ E.g., Victoria (Australia), Melbourne and Metropolitan Board of Works Act, 1958, sec. 77, Victoria Statutes, 1958, vol. V, p.6310; Brunei, Water Enactment, No. 12, 1962, sec. 12
- 61/ Italy, Royal Decree of December 11, 1933 (Testo Unico), art. 9, (1933) Racolta Ufficiale delle Leggi e dei Decreti del Regno d'Italia, vol. 5, p.30; Peru, Act No. No. 15037 of May 21, 1964, art. 110 (English text in food and Agricultural Legislation, vol. 13, No. 4, v/1b (1964-65)).
- 62/ For example, eleven government departments in one state administer between them more than seventy separate pieces of legislation with general application to water and many others with a limited application. Another state has forty-six legislative texts (some dating back to the early nineteenth century) and eleven administrative authorities at the national level. A third, with thirty-five separate laws, has eight different water directorates - hydraulic works, soil conservation and farm irrigation, agricultural affairs, forestry, electric power, surveying and development, rural electricity and water supply, regional planning and reconstruction and natural catastrophes - among the four ministries concerned with water. Water Legislation in Asia and the Far East, Part 1, *supra* note 48, pp. 103-16; FAO, Water Law in Selected European Countries, Vol. I (Legislative Study No. 10)(1975), pp. 1-26, 211-53.
- 63/ For example, the Ministry of Irrigation in South Australia, the departments of irrigation in several of the Argentine provinces, the Bureau of Reclamation in the United States, the autonomous National Irrigation Enterprise of Chile, and the National Irrigation Fund of Ecuador.
- 64/ E.g., the powers of the Mendoza (Arg.) Irrigation Department, which was organized by a 1905 law, were outlined in the 1949 Constitution of that province. See G.J. Cano and F.F. Vargas Galindez, Las Leyes de Aguas en Sudamérica (FAO Agricultural Development Papers Ho. 56)(1956), pp.16-17.
- 65/ See, generally, J. Litwin, Control of river pollution by industry (1965).
- 66/ For example, in Burma, authorization for the use of groundwater was given by water officers, Burma, Underground Water Act, No. IV of 1930 Sec. 3, Burma Code, Vol. V (1943), p.194. In the U.S.S.R., permission to use groundwater is given by agencies of geology and minerals, O.S. Kolbasov, "Legislation on Water Use In the U.S.S.R.", in I.K. Fox, ed., Water Resources Law and Policy in the Soviet Union (1971) p. 157. Generally on agencies granting authorization, see L. Teclaff, Abstraction and Use of Water, *supra* note 13, pp.137-41.
- 67/ Cano has criticized use-oriented administration thus:
- "These agencies considered the uses, but not the resources thus utilized, and cared little for their conservation, or for whether the use they made thereof rendered them useless for different, simultaneous or subsequent uses. What has just been stated in the past tense nevertheless constitutes the present situation in many countries, a situation that works against rational natural resources administration."
- G. Cano, A legal and insitutional framework for natural resources management (F.A.O. Legislative Studies No. 9), p. 19 (1975).

- 68/ United States, National Environmental Policy Act, 42 U.S.C. sec. 4332 (2)(c)(1970).
- 69/ United States, Fish and Wildlife Coordination Act, Act of August 12, 1958, Pub. L. No. 85-624, 72 Stat. 563, 16 U.S.C. sec. 662 (a)(1970).
- 70/ United States, 33 Code of Federal Regulations 209-120 (1969).
- 71/ United Nations EcoSoc Council Off. Rec. 21st Sess., Annexes (E/2827)(1956), p.6. On the history of development of the river basin concept, see Teclaff, The River Basin in History and Law (1967), pp.119-23.
- 72/ United States, Tennessee Valley Authority Act, Act of May 18, 1933, oh. 32, sec 22, 48 Stat. 69, 16 U.S.C. 831 (u)(1970).
- 73/ Ibidem, sec. 5, 16 U.S.C. 831 (d)(1970), and secs. 10-13 16 U.S.C. secs. 831
- 74/ India, Damodar Valley Corporation Act, Act No. 14, March 27, 1948, India Code, Vol. 6 (1956), pp.13-33, art. 12(f).
- 75/ Sri Lanka, Gal Oya Development Board, Act No. 51, November 24, 1949, art. 15(I).
- 76/ Colombia, Presidential Decree No. 1707, July 18, 1960, art. 4.
- 77/ Brazil, Law No. 541, December 15, 1948, (1948) Colecção das Leis, v. 7, p. 141, art. 7 (a).
- 78/ See C.W. Howe, The effect of water resources development on economic growth, in United Nations, Economic and Social Commission for Asia and the Pacific, Proceedings of the First Session of the Committee on Natural Resources (Water Resources Series No. 46) (1975), pp.66-67; also A. Orive Alba, Water resource s administration in Mexico, in United Nations, Department of economic and Social Affairs, National Systems of Water Administration (1974) (ST/ESA/17), p. 142 at p.154.
- 79/ United Nations, Economic Commission for Asia and the Far East, Multiple-Purpose River Basin Development, Part 2D (ST/ECAFE/SER.F/18) (Flood Control Series No. 18) (1961), p.8.
- 80/ See Tennessee Valley Act, 16 U.S.C. sec. 831 (1970); also Martin, Tennessee Valley Authority; a study of federal control, Law and Contemporary Problems, vol. 22 (1957), p.351, at p.356; and Investigation of the Tennessee Valley Authority, U.S. Senate Doc. No. 56, 76th Congress, 1st Session (1939), p.95.
- 81/ Brazil, Law No. 541, December 15, 1948, (1948) Colecção das Leis, vol. 7, at 141, arts. 6 (1) and 13.
- 82/ See United Nations Economic Commission for Asia and the Far East, supra note 79, p.8.
- 83/ See Teclaff, The River Basin, supra note 71, pp.130-32.

84/ D. Lilienthal, Democracy on the March 53 (1953); Sinha, A note on organization for effective execution of river basin development, in U.N. economic Commission for Asia and the Far East, Regional Technical Conference on Water Resources Development in Asia and the Far East, Proceedings (ST/ECAFE/SER.F/9)(9156), p.435. The rise of regionalism was linked to the river valley also in a U.S. water resources planning study, as follows:

"With the development of the Nation in the great river valleys which gave form to regions, the relationship of people to rivers became more complex, raising new possibilities of use, new problems of conservation, and new necessities for controlling their water. The river made its contribution to simple regional economy."

U.S. President's Water Resources Policy Commission, A Water Policy for the American People (1960), p.3.

85/ See United Nations, Economic Commission for Asia and the Far East, A Case Study of the Comprehensive Development of the Kitakami River Basin (Flood Control Series No. 20)(ST/ECAFE/SER.F/20)(1962), p.46, in which statistics of economic progress in the Tennessee and Kitakami basins are compared.

86/ United Nations, Department of Economic and Social Affairs, Integrated River Basin Development (U.N. Doc. No. E/3066 Rev.1)(rev. ed. 1970), p.1

87/ According to a study undertaken in Mexico, for example:

"...the attempts at integrated basin development in the isolated tropical basins (Papaloapan and Grijalvas) have largely been failures, while the more specialized development efforts in the arid areas (Tepalcatepec-Balsas and Fuerte) have been moderately and highly successful when judged from the multiple-objective viewpoint of Mexico's development policy."

Howe, supra note 78, pp.66-67.

88/ Supra note 86, p.27.

89/ Another study has identified this same shortcoming of the valley authorities, but expressed it somewhat differently:

(They)... engage in... "incomplete synoptic analysis, i.e. in reality they do not consider all of the national objectives, they consider only their own area, and they tend to ignore side effects on other areas and objectives such as prices or balance of payment effects..."

Howe, supra note 78, p.68.

90/ See Gieseke, River basin authorities on the Ruhr and on other rivers in Germany, in United Nations Conference on Water Pollution Problems in Europe, Documents (U.N. Doc. No. Water Poll./Conf.4)(1961), vol. 2, p.277; also Fair, Pollution Abatement in the Ruhr district, in Comparisons in Resource Management (Jarrett ed. 1961), p.156.

91/ Australia, River Murray Commission, The development of control of the waters of the River Murray under the River Murray Agreement, in United Nations Economic Commission for Asia and the Far East, supra note 83, p.423.

- 92/ See France, Decree of June 5, 1934, approving the contract of December 20, 1933, between the Minister of Public Works and the Compagnie Nationale du Rhône, (1934) Journal Officiel 5886; Compagnie Nationale du Rhône, Statuts Mis à Jour . en 1960 and Recueil des Textes Constitutifs (1951); also F.A.O., Water Law in Selected European Countries, supra note 62, pp.80-81. This is not a truly basin-wide organization, because its scope does not include tributaries.
- 93/ See, generally, Teclaff, The River Basin, supra note 71, pp. 143-49.
- 94/ For example, the Delaware River Basin Commission, established by the Delaware River Basin Compact, 1961, 75 Stat, 691.
- 95/ E.g., the Canadian River Compact, 1950, 66 Stat. 76-77; Costilla Creek Compact, 1963, 70 Stat. 350; Rio Grande Compact, 1938, 53 Stat. 786; Upper Colorado River Basin Compact, 1948, 63 Stat. 35. Texts of these compacts may be conveniently found in R. Witmer, ed., Documents on the Use and Control of the Waters of Interstate and International Streams (U.S. Dep't. of the Interior 1958), 2d ed.
- 96/ See United Nations Economic Commission for Latin America, Systems of Administrative Organization for the Integrated Development of River Basins (U.N. Doc. No.E/CN.12/503/)(1959), p.48.
- 97/ See United Nations Economic Commission for Asia and the Far East, Fourth Regional Technical Conference on Water Resources Development in Asia and the Far East, Proceedings (U.N. Doc. No. ST/ECAFE/SER.F/19)(1962), pp.83-87.
- 98/ This agency's successor, the Inter-Agency Committee on Water Resources, was abolished after passage of the Water Resources Planning Act, 79 Stat. 249, 42 U.S.C.A. 1962 (1970). See National Water Commission, Water Policies for the Future (1973), p.416.
- 99/ United Nations Economic Commission for Asia and the Far East, supra note 96, p.93; see also L.L. Vendiola, The Philippines, in Water Legislation in Asia and the Far East, Part 1, supra note 49, p.146.
- 100/ United Nations Economic Commission for Latin America, supra note 96, p.11.
- 101/ See Case Study of the Comprehensive Development of the Kitakami River Basin, supra note 85, pp.37-38, 43-44.
- 102/ United States, Water Resources Planning Act of 1965, 79 Stat. 244, 42 U.S.C. 1962 et seq. (1970). See generally, on the work of the river basin commissions authorized by this act, H.P. Caulfield, Jr., The conciliar approach to organization for water resource planning within a federal system of government, in United Nations Development Programme, Proceedings of the Interregional Seminar on Water Resources Administration, New Delhi, 22 January to 2 February 1973 (DP/UN/INT-70-37)(1975), p.113, at 116-19.
- 103/ See Ackerman, Organization for water resources development in the United States with particular reference to the Tennessee Valley Authority, in United Nations Economic Commission for Asia and the Far East, supra note 84, pp.439-40.

104/ Case Study of the Comprehensive Development of the Kitakami River Basin, supra note 85, pp.43-44. In conclusion, the study said:

"It is an accepted principle that a river basin, being an organic unity, should be developed as an integrated unit. If an integrated plan can be prepared by careful coordination of plans prepared separately by various functional agencies, each dealing with a certain phase of development... there is no call for the organization of a single authority for the preparation of a comprehensive plan. However, the coordinating body must be well staffed in order to undertake such a task, which will include not only the coordination of the skeleton plan at the beginning, but also the details of the plan as the programme. This is not a matter of one body having authority over other agencies, but of working out by discussion and persuasion the most appropriate comprehensive plan of development."

On the administrative structure required for execution, the study declared that:

"If... public or private agencies have long been established and have long undertaken the execution of certain phases of development, a practical approach would be to utilize the existing agencies and institutions for the execution of the programme. In such cases, a single coordinating body, having sole authority to supervise, if not to administer the actual implementation of the various phases of the programme, is indispensable. Thus though the different kinds of developmental work may be executed by different agencies, this should be done under the single direction of a coordinating body."
Ibidem, p.44.

105/ United Kingdom, England and Wales, Water Resources Act, 1963, c. 38; Water Act, 1973, c. 37. For a detailed analysis of the powers and duties of water authorities under the latest reorganization, see J. McLoughlin, The Water Act 1973 (1973).

106/ See I.Z. Balló and K. Szesztay, Water resources administration in Hungary, in National Systems of Water Administration, supra note 78, pp.85-107, at pp.93-98.

107/ France, Law No. 64-1245 of December 16, 1964, on the Regime and Distribution of Waters and Protection Against Pollution, art. 13, (1964) Bull. Législatif Dalloz, p.674, at p.676.

108/ As an outcome of the recommendations of the Crown-appointed Study Commission on Water Boards.

109/ On the powers and scope of the different types of entities discussed here, see R.W. Johnson and G.M. Brown, Jr., Comprehensive management and effluent charge systems in European water management, Working Paper No. E/F.87, in International Association for Water Law, Working Papers of the 2nd International Conference on Water Law & Administration, Caracas, 8-14 February, (1976), vol. 7, p. 613 et seq.

110/ France, Law of 8 April 1898, Concerning the Regime of Waters, arts. 11, 12, and 16, Bulletin des lois, 12th ser., vol. II (1898), p.394; Poland, Water Law of 30 May 1962, art. 44 (1), Dziennik Ustaw (1962) p.289; Japan, River Law, Law No. 167 of 1964, art. 23.

- 111/ For example, the states (under the supervision of the federal Environmental Protection Administration) establish water quality standards and issue permits for the discharge of effluents. Rarely is this function granted to a river basin entity - the Delaware River Basin Commission is one which has such powers. See State Standards for Anti-Degradation, issued "by the Environmental Protection Administration's Office of Water Programs, Environmental Reporter, State Water Laws, (1973), p.621:0101 et seq.
- 112/ United States, Department of the Interior, Pacific Southwest Water Plan, Appendix I, (1963), p.1.
- 113/ W. Warne, California pioneers new water development concepts, Natural Resources Journal, vol. 2 (1962), pp.248, 250.
- 114/ See, generally, Teclaff, The River Basin in History and Law, pp.185-92, 202-03 (1967); F.J. Quinn, Area-of-origin Protectionism in Western Waters (Canada, Inland Waters Directorate, Water Planning and Management Branch)(1973); Vendroy, Water management problems of western Siberia, Soviet Geography (May 1964), pp.13-23; (translated from Izvestiya Akademii Nauk S.S.S.R., 1 Seriya Geograficheskaya 36-44 (1963)); India, Central Water and Power Commission, Water Wing, Note on National Water Grid of India (1973).
- 115/ See I. Belyaev, Interbasin transfer of water resources, Working Paper No. 56, p. 37, United Nations Department of Economic and Social Affairs, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, 16-26 September 1975 (1975); Compagnie Nationale d'Aménagement de la Région du Bas-Rhône et du Languedoc, Irrigation and Allied Projects in the Lower Rhône and Languedoc Districts of Southern France (mimeographed, 1964); Note on National Water Grid of India, supra note 114.
- 116/ Paradoxically, some of the basins running out of water now supply areas beyond their drainage divides. The Colorado basin is already water bankrupt and when all entitlements are taken up and all presently authorized projects are constructed, the total demands to meet existing diversions through the Continental Divide as well as the terms of the 1922 Compact and the 1944 treaty with Mexico will be very much greater than the supply. Hence the Colorado basin and communities outside it which it now supplies feature it as an area of import in most of the major Western interregional water transfer proposals. See U.S. Senate, Select Committee on National Water Resources, Report, S. Rep't No. 29, 87th Congress, 1st Session (1961).
- 117/ California Water Code, secs. 10505, 10505.5, and 11460 (1971).
- 118/ 25 Op. Cal. Att'y-Gen. 8-9 (1955).
- 119/ Colorado Revised Statutes Annotated, secs. 37-81-101 (surface water) and 37-90-136 (ground water)(1973).
- 120/ Western States Water Council, Rules of Organization, art. III, quoted in Clark, Northwest-Southwest water diversion, Willamette Law Journal, vol. 3 (1964-65), p. 215, at p.251.
- 121/ United States, Water Resources Planning Act of 1965, 42 U.S.C. sec. 1962-1 (1970).

- 122/ Two landmark Supreme Court cases, United States v. Gerlach Livestock Company and Arizona v. California, confirmed the federal power and established its constitutional nature. In United States v. Gerlach Livestock Company, concerning the right of the federal government to authorize and construct projects involving water transfers between basins (but within a single state), the Court found the congressional power to build California's Central Valley Project to lie in the welfare clause of the Constitution. In Arizona v. California, concerning allocation of Colorado River waters by the federal government between several states, the Court determined the power to be both in the commerce and welfare clauses of the Constitution and affirmed that in exercising it the federal government might override inconsistent state laws.
- United States v. Gerlach Livestock Company, 339 U.S. 725, 737-38 (1950); Arizona v. California, 373 U.S. 546, 587 (1963).
- 123/ United States, Rivers and Harbors Act of 1962, 76 Stat. 1173, 1191.
- 124/ United States, Department of the Interior, Pacific Southwest Water Plan - January 1964 Report. Including August 1963 Report as Modified January 1964 (1964), p.9.
- 125/ Senator H. Jackson, quoted in O. Bullard, Crisis on the Columbia (1968) p.145.
- 126/ United States, National Water Commission, Interbasin Water Transfers; A Political and Institutional Analysis (PB-208-303) (1972), pp.95-96.
- 127/ Ibidem, p.107.
- 128/ Australia, Governor General's Proclamation of 28 April 1954, (1954) Commonwealth of Australia Gazette 1357-59.
- 129/ Australia, Snowy Mountains Hydro-Electric Power Act, 1949-1958, First Schedule.
- 130/ France, Decree No. 56-807, Approving Statutes of a Semi-Public Company Named the Compagnie Nationale d'Aménagement de la Région du Bas-Rhône et du Languedoc, July 27, 1956, (1956) Journal Officiel 7696; and Compagnie Nationale d'Aménagement de la Région du Bas-Rhône et du Languedoc, Recueil des Textes Constitutifs (1962).
- 131/ A. Van Burkalow, The geography of New York City's water supply: a study of interactions, Geographical Review, vol. 49 (1959), p.369 et seq.; Birmingham, Act of 1892, 55 & 56 Vict., c. "CIXXIII (1892); Manchester Corporation Waterworks Act, 1879, 42 & 43 Vict., c. XXXVI (1879); Liverpool Corporation Waterworks Act, 1880, 43 & 44 Vict., c. CXLIII (1880); W. Warne, California pioneers new water development concepts, Natural Resources Journal, vol. 2 (1962), p.248, at pp.252-53.
- 132/ New York City Administrative Code, Title K, ch. 51. See Gregory v. City of New York, 346 F. Supp. 140 (1972).
- 133/ See Teclaff, Abstraction and Use of Water, supra note 13, p.21.
- 134/ City of Los Angeles v. Glendale, 23 Cal. 2d 68, 142 P. 2d 289 (1943).
- 135/ See S. Martin-Retortilio, Water resources administration in Spain in National Systems of Water Administration, supra note 78, p.166 at p.171; F.A.O. , Water Law in Selected European Countries, supra note 62, p.174.
- 136/ Tamir, supra note 41, pp.10-12, 16-17, 26-28.

- 137/ California Water Code, sec. 1460 (1971).
- 138/ See California, Metropolitan Water District Act, California Water Code - Appendix, secs. 109-1 - 109-550 (1976 Supp.). The areal unit of such a district may be formed of territory within the corporate boundaries of any two or more public agencies, which need not be contiguous. Sec. 109-26.
- 139/ Arizona Revised Statutes, secs. 45-2613 and 45-2613.01 (Supp.1975).
- 140/ See Teclaff, Abstraction and Use of Water, supra note 13, pp.102-06; Tamir, supra note 41, pp. 79-80; Caponera, Water Laws in Moslem Countries, supra note 11, p.181.
- 141/ Teclaff, supra, pp.89-91.
- 142/ United Kingdom, England and Wales, Water Act, 1973, c.37, sec. 11. See also Richardson, System of water law and organization in the United Kingdom, in Proceedings, International Conference on Global Water Law Systems, Valencia, Spain, 1-9 September, 1975, pp. F-30 - p-31, and F-37 - F-39.
- 143/ In the 1976 drought emergency in Britain, for example, water authorities could be given almost carte blanche powers under section two of the Drought Act. The drought orders issued under the relatively mild section one of the act have already resulted in the cutting off of household supplies for up to 17 hours a day in some areas. (Unfortunately, these measures have not resulted in commensurate savings. London's drought order is expected to save only an extra two-and-a-half per cent of consumption.) (Economist, August 21, 1976, p.79)
- 144/ See Gaffney, Comparison of market pricing and other means of allocating water resources, in Water Law and Policy in the Southeast, Papers prepared for presentation at the Southeastern Water Law Conference, University of Georgia, November 7-10, 1961, pp.195-227 (1962).
- 145/ Quinn, Area-of-origin protectionism in Western waters, supra note 114, P 10.
- 146/ Ibidem.
- 147/ Denver's history of litigation with irrigators in the South Platte basin, for example, encouraged it rather to seek new supplies in the Colorado River basin across the Continental Divide.
- 148/ United Nations, Department of Economic and Social Affairs, The Demand for Water: Procedures and Methodologies for Projecting Water Demands in the Context of Regional and National Planning (Natural Resources/Water Series No. 3)(ST/ESA/38) (1976), p.61.
- 149/ Ibidem.
- 150/ United Kingdom, Metropolitan Water Act of 1902, 2 Edw. 7, ch. 41.
- 151/ Municipality of Metropolitan Toronto Act of April 15, 1953, Ont. Rev. Stat. c.260 (1960).
- 152/ United States, Demonstration Cities and Metropolitan Development Act of 1966, 42 U.S.C. sec. 3334 (1970).
- 153/ Ibidem.

- 154/ Quinn, supra note 114, p.86, fn. 153.
- 155/ The Thames Water Authority was established by Ministerial Order (Statutory Instruments 1973 No. 1360). On the London representation, see Water Act, 1973, c. 37, sec. 3(7). Contrast, for example, Colorado law which expressly forbids any river basin authority established within the state to include the metropolitan area of Denver, Colorado Revised Statutes Annotated, sec. 37-93-108 (1973).
- 156/ United Kingdom, Water Act, 1973, c. 37, Schedule 3, sec. 43(1).
- 157/ Ibidem, sec. 43(2).
- 158/ United States, Delaware River Basin Compact, 1961, P.L. 87-328, 75 Stat. 688.
- 159/ United Kingdom, River Boards Act, 1948, 11 & 12 Geo. 6, c. 32, Second Schedule, Sec. 1.
- 160/ United Kingdom, Water Resources Act, 1963, c. 38, and Water Act, 1973, c. 37.
- 161/ Ibidem, Part I.
- 162/ See P.H. Sand, The socialist response: environmental protection law in the German Democratic Republic, Ecology Law Quarterly, vol. 3 (1973), p.451, at p.456, n. 25.
- 163/ German Democratic Republic, Statute of 5 February, 1969, Concerning the Agency for Water Management, (1969) G. Bl. II.129; Public Notice of 3 January 1972, on the Creation of Ministries, (1972) G. Bl. II. 18.
- 164/ See I.Z. Bailó and K. Szesztay, Water resources administration in Hungary, in United Nations, Department of Economic and Social Affairs, National Systems of Water Administration (1974) (ST/ESA/17), pp.85 and 93-98.
- 165/ United States, Water Resources Planning Act of 1965, 79 Stat. 244, 42 U.S.C. 1962 et seq. (1970). See, generally, on the powers and functions of the Water Resources Council. H.P. Caulfield, Jr., The conciliar approach to organization for water resources planning within a federal system of government, in United Nations, Interregional Seminar on Water Resources Administration. New Delhi, 22 January-2 February 1973, Proceedings (DP/UNT/INT-70-371)(1975), p.113, at pp.116-17.
- 166/ United States, Water Resources Council, Principles and standards for planning water and related land resources, 38 Federal Register 24778 et seq. (10 September 1973).
- 167/ United Nations, Interregional Seminar, Proceedings, supra note 165, p.12.
- 168/ United Kingdom, Secretary of State for the Environment Order 1970, Statutory Instruments 1970 No. 1681, art. 2(1); German Democratic Republic, Public Notice of 3 January 1972 on the Creation of Ministries, (1972)G. Bl. II. 18.
- 169/ United States, Reorganization Plan No. 3 of 1970, 35 Federal Register 15623 (1970).

- 170/ See B. Wohlwend, Legal and institutional criteria needed to provide effective instruments for the rational and integrated inventory, development, conservation and use of water resources, in International Association for Water Law, IInd International Conference on Water Law & Administration, Caracas, 8-14 February 1976, Working Papers, vol. 6, p. 489, at pp. 492-97.
- 171/ "By natural law the air, flowing water, the sea, and therefore the shores of the sea are common to all." Institutes 2.1.1. See also D.A. Caponera, Roman Water Law System, in Proceedings of the International Conference on Global Water Law Systems, Vol. I, Colorado State University, 1976, pp.173-92.
- 172/ (Ulpian) "Some rivers are public; others not. Cassius defines a public river as a perennial river. This definition, approved by Celsus, appears correct." Digest 43.12.1.3, translated in Ware, Roman Water Law, (1905), sec. 19 (hereinafter referred as Ware).
- 173/ Digest 43.12.1, 39.3.10.2, 43.12.2, translated in Ware, secs. 16, 30 and 38.
- 174/ (Ulpian) "... (A) private river differs in no sense from any other private property." Digest 43.12.1.4, translated in Ware, sec. 20.
- 175/ See G. MacGrady, The navigability concept in the civil and common law, Florida State Univ. Law Review, vol. 3 (1975), p.511, at pp.517-34.
- 176/ For the development of the public domain concept, see M. Planiol, Traité élémentaire de droit civil, v. 1, part 2 (28th ed., 1939) (English translation by Louisiana State Law Inst., 1959).
- 177/ In Lamprey v. Metcalf, 52 Minn. 181, 53 N.W. 1139 (1893), the court said:
"The division of waters into navigable and non-navigable is but a way of dividing them into public and private waters "
See also The Propeller Genesee Chief v. Fitzhugh, 53 U.S. (12 How.) 443 (1851), in which the court said:
"In England, therefore, tide-water and navigable water are synonymous terms, and tide-water... meant nothing more than public water."
See also Stone, Public rights in water uses and private rights in land adjacent to water, in Clark, Water and Water Rights, v. 1 (1967), pp.202-06.
- 178/ See Sherrard v. City of Baker, 63 Ore. 28, 125 P. 826 (1912); also Clark, Classes of water and character of water rights and uses, in Water & Water Rights, supra, pp.349-55.
- 179/ France, Law of April 8, 1910, art. 128, (1910) Bulletin des Lois, Nouvelle Série, Partie Principale (1ère Section) Tome Deuxième, Nos. 28-48, p.937; Code du Domaine Public Fluvial, art. 2-1. See generally, Teclaff, Private Water Rights in France and the Eastern United States, American Journal of Comparative Law, v. 11, p.560, especially p.562 (1962).
- 180/ Law No. 64-1245 of 16 December 1964, on the Regime and Distribution of Waters and Protection Against Pollution, arts. 36-37, Bulletin législatif Dalloz (1964), p.674.

- 181/ In Gibbons v. Ogden, 22 U.S. (9 Wheat.) 1, at 190 (1824).
- 182/ Oklahoma v. Atkinson, 313 U.S. 508, at 523, 525 (1941).
- 183/ United States, Federal Water Pollution Control Act Amendments, 33 U.S.C.A. sec. 502 (7)(Supp. 1976).
- 184/ See, e.g., Natural Resources Defense Council v. Callaway, 7 ERC 1784 (D.C.D.C. 1975).
- 185/ France, Law Concerning the Regime of Waters, April 8, 1898, (1898) Bulletin des Lois, pt. principale, t.2 (12e sér.), p. 394; see also Colin & Capitant, Cours élémentaire de droit civil français, v. 1 (1931), p. 761.
- 186/ Spain, Law of Waters of 13 June 1879, Gaceta (19 June 1879), Boletín de la revista general de legislación y jurisprudencia, vol LIX (1879).
- 187/ Italy, Civil Code of 1865, art. 427. See A.G. Spota, Tratado de derecho de aguas, vol. 1 (1941), p.463.
- 188/ See, e.g., Peru, Decree-Law No. 17.752, General Water Act of 24 July 1969 (English text in Food and Agricultural Legislation, vol. XIX, No. 1,V/4a). Art. 1 states:
"All waters, without exception, shall be the property of the State, and ownership thereof shall be inalienable and immune from prescription. No private ownership shall subsist in respect of water or of any acquired rights thereto. The use of water, provided it be justified and rationally pursued, shall be authorized solely if such use is consonant with public interest and national development."
- Israel, Water Law, 5719-1959, Sefer Ha-Chukkim No. 288 (13 August 1959), p..169. Art. 1 states:
"The water resources in the State are public property; they are subject to the control of the State and are intended for the use of its inhabitants and for the development of the country."
- Iran, Water Law and the Manner of Water Nationalization, of 18 July 1968 (English text in United Nations, Economic Commission for Asia and the Far East, Water Legislation in Asia and the Far East, Part 2 (Annex)(1968). Art. 1 declares that:
"All waters... are considered as the national wealth and belong to the public, and the responsibility for safeguarding and utilization of this national wealth and the establishment and management of water resources development establishments are charged to the Ministry of Water and Power."
- And California Water Code, sec. 102 declares:
"All water within the state is the property of the people of the state..."
- For a list of similar declaration of the western states of the United States, see 1 Clark, Waters and Water Rights 242 (1967).

- 189/ The trust principle was defined rather aptly by the U.S. Supreme Court as follows:
- "The state can no more abdicate its trust over property in which the whole people are interested, like navigable waters and soils under them, so as to leave them entirely under the use and control of private parties... than it can abdicate its police powers in the administration of government and the preservation of the peace."
- Illinois v. Illinois Central Railroad, 146 U.S. 387, 453 (1892)
- 190/ See Teclaff, Abstraction and Use of Water, *supra* note 13, pp.58-60.
- 191/ United Kingdom, England and Wales, Water Act, 1945, 8 & 9 Ceo. VI, c. 42; Australia, Victoria, Groundwater Act, 1969. See also S.D. Clark and A.J. Myers, Vesting and divesting: the Victorian Groundwater Act 1969, Melbourne University Law Review, vol. 7 (1969/70), p.237.
- 192/ Spain, Law of Waters of 3 August 1866, arts. 45 and 48, Gaceta (7 August 1866), Boletín de la revista general de legislación y jurisprudencia, vol.XXV (1866), p.165; Law of Waters of 13 June 1879, art. 18, Gaceta (19 June 1879), Boletín de la revista general de legislación y jurisprudencia, vol. LIX (1879), p 21; Civil Code of 1889, art. 408.
- 193/ Spain, Decree No. 43/65 of 14 January 1965, in execution of Law No. 59 of 24 December 1962, Regulating the Development of Waters and Waterworks in the Canary Islands, Enciclopedia jurídica española (1965), Appendix (1966), p.118; also Decree-Laws of 17 July 1968, 30 June 1969 and 5 April 1973, pertaining to Andalusia, Baleares and Almería. See Carlos C. Arrieta, Surface and underground waters in Spain, p.Q-37 in Paper No. Q-1 presented to International Conference on Global Water Law Systems, Valencia, Spain, September 1975.
- 194/ Argentina, Código Civil (1869), art. 2340, para. 3 (as amended by Law No. 17711 of 1967).
- 195/ Law Concerning the Regime and Distribution of Waters and Protection Against Pollution, December 16, 1964, arts. 40 and 46-47, Bulletin Législatif Dalloz, vol. 47 (1964), pp.674, 681.
- 196/ As, for example, in Nevada, Kansas and Idaho (Nevada Revised Statutes (1973), secs. 533.025 and 533.030; Kansas Statutes, Annotated (1969), secs 82a-702 -82a-703; Idaho Code (Supp. 1976), sec. 42-226), where all waters are declared public or in California (California Water Code (1971), sec. 1200), where waters flowing in definite channels are made public.
- 197/ For example, in Nevada, Kansas, and Idaho. See *supra*, note 196.

- 198/ Colorado Revised Statutes, Annotated (1973), secs. 37-90-103 - 37-90-141; Montana Revised Codes, Annotated (1964 and Supp. 1975), secs. 89-2911 - 89-2936; Nevada Revised Statutes (1973), secs. 534 010 - 534-190; New Mexico Statutes, Annotated (1968), secs. 75-11-1 - 75-11-40; Oklahoma Statutes, Annotated (Supp. 1975-76) title 82, secs. 1020.1-1020.22; Oregon Revised Statutes (1975), secs. 537.505-537.990; South Dakota Codified Laws, Annotated (Supp. 1976), secs. 46-6-1 - 46-6-11; Washington Revised Code, Annotated (1962), secs. 90.44.010-90.44.250; Wyoming Statutes, Annotated (Supp. 1975), secs. 41-121 - 41-147.
- 199/ North Dakota Century Code (1960), sec. 61-01-01; Utah Code, Annotated (1968), secs. 73-1-1 and 73-3-1.
- 200/ Israel, Water Law No. 5719-1959 of 1959, art. 1, Sefer Ha-Chukkim No. 288 (13 August 1959), p.169.
- 201/ Ibidem, art. 4.
- 202/ Turkey, Act No. 167 of 16 December 1960, arts. 4 and 5. (See FAO, Groundwater Legislation in Europe, p.139 (1964)). Iran, Water Law of 18 July 1968 and the Manner of Water Nationalization, art. 25. (English text in United Nations, Economic Commission for Asia and the Far East, Water Legislation in Asia and the Far East, Part 2, annex, pp.217-226.)
- 203/ Poland, Water Law of 30 May 1962, arts. 36 (1) and 37, Dziennik Ustaw (1962). p.289. Also Water Law of 24 October 1974, art. 49 (1), Dziennik Ustaw (1974), p.443. But this does not set any conditions as to depth of wells; it merely specifies that extraction be for domestic purposes.
- 204/ United Kingdom, England and Wales, Water Resources Act, 1963, c. 38, sec. 24.
- 205/ In some cases it is explicitly so stated. E.g., the Peruvian General Water Act of 1969, which in art. 1 proclaims all waters to be property of the State, in art. 4 enumerates them, including atmospheric water. Peru, Decree-Law No. 17.752 (English text in Food & Agricultural Legislation, vol. XIX, No. 1, V/4a). It is explicitly stated also in Montana law:
"All surface, underground, flood and atmospheric waters within the boundaries of the state are the property of the state for the use of its people..."
Revised Codes of Montana 1947, v. 1, pt. 1, art IX, sec. 3 (3) (Supp. 1975).
- 206/ For example, in the United States this claim was finally put to rest by the Supreme Court (though in another context) in United States y Causby, 328 U.S. 256 (1946).
- 207/ D.A. Caponera, Water Laws in Moslem Countries (F.A.O. Irrigation & Drainage Paper 20/1) (1973), p. 17; Spain, Law of Waters of 3 August 1866, arts. 45 and 48, Gaceta (7 August 1866), Boletín de la revista general de legislación y jurisprudencia, vol XXV (1866), p.165; Jujuy (Arg.), Código de Aguas, Law No. 1961 of 12 October 1950, arts. 259 et seq., Anales de legislación Argentina, vol. X-B (1950), p.2234; Bolivia, Law of Waters of 28 November 1906, art. 20 Anuario de leyes (1906), p.414 and appendix; Philippines, Special (Spanish) Law of Waters of 3 August 1866, art. 48.
- 208/ See FAO, Groundwater Legislation in Europe (1964), p. 116.

- 209/ California Government Code, sec. 53063 (1966). See also S. Sato, The role of local governmental units in weather modifications California, in H.J. Taubenfeld, Controlling the Weather: A study of Law and Regulatory Procedures (1970), pp.226-28.
- 210/ However, Utah law states, for example, that:
- "All water derived as a result of cloud seeding, shall be considered as a part of Utah's basic water supply the same as all natural precipitation water supplies have been heretofore, and all statutory provisions that apply to water from natural precipitation shall also apply to water derived from cloud seeding."
- Utah Code Annotated, sec. 73-15-4 (Supp. 1975).
- 211/ See A.G. McKenzie, Weather modification: a review of the science and the law, Environmental Law, vol. 6 (1976), p.387. The state weather modification legislation is listed at pp.413-14, n. 102.
- 212/ Ibidem, p. 414, n. 103. Compare, however, Utah law which states:
- "The state of Utah through the division of water resources shall be the only entity, private or public, that shall have authority to authorize... cloud-seeding research, evaluation, or implementation projects..."
- Utah Code Annotated, sec. 73-15-3 (Supp. 1975).
- 213/ McKenzie, supra, p.414.
- 214/ E.g., Oregon Revised Statutes, sec 558.060 (1975). In Utah, however, the operator must meet qualifications established by the Division of Water Resources. Utah Code Annotated, art. 73-15-6 (Supp. 1975). Pennsylvania imposes, strict liability on its licensees, as follows:
- "Any licensee who causes a drought as determined by the board shall compensate farmers for damages. Any licensee who by causing heavy downpours or storms which cause damage to lands as determined by the board shall compensate farmers and property owners for such damages."
- Pennsylvania Statutes Annotated, tit. 3, sec. 1114 (Supp. 1975).
- 215/ United States, Weather Modification Reporting Act of 1971, P.L. 92-205, 18 December 1971, 85 Stat. 735, 15 U.S.C.A. sec. 330 et seq.
- 216/ 37 Federal Register 22977 (October 27, 1972)(U.S. National Oceanic and Atmospheric Administration, maintaining records and submitting reports on weather modification activities).
- 217/ United States National Water Commission, Report, Water Policies for the Future (1973), p.351.
- 218/ See McKenzie, supra note 211, p. 419.

- 219/ Canada-United States, Agreement on the Exchange of Information on Weather Modification Activities. 26 March 1975, (TIAS 8056), International Legal Materials vol. 14 (1975), P-589.
- 220/ See McKenzie, supra note 211, p.418-9, n. 120; and International Legal Materials vol. 14 (1975), p.589.
- 221/ Report of the Task Group on the Legal Implications of Weather Modification, in Taubenfeld, supra note 209, p.3, at p.25.
- 222/ The history of these measures is discussed in R.W. Johnson, Federal organization for control of weather modification, in Taubenfeld, supra note 209, at pp.146-58.
- 223/ F. Maloney, R. Ausness and J. Morris, A Model Water Code (1972), p.295. But even so, the authors favour state control because the states currently dominate regulation in the United States.
- 224/ Cordoba (Arg.), Código de Aguas, Decreto Ley 5589, (prepared under the direction of Dr. Joaquin Lopez, of the University of Mendoza)(1973), art. 157.
- 225/ Switzerland, Arrêté fédéral concernant une révision de la constitution dans le domaine de l'économie des eaux, 20 June 1975, art. 24 bis /nouveau/, 2c, Feuille Fédérale, vol. II, No. 25, 30 June 1975.
- 226/ Colombia, National Code of Renewable Natural Resources and Protection of the Environment, 1974, Decreto No. 2811 of 18 December 1974, Part III, art. 77, Diario Oficial, 2 January 1975, p.145.
- 227/ 33 U.S.C. sec. 407 (1970).
- 228/ Paszto, Recent trends in water quality management and protection in Hungary, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, 16-26 September 1975, Working Paper No. 15, p.11 (1975).
- 229/ United Kingdom, Water Resources Act 1963, ch. 38, sec. 19; France, Code Rural, art. 97-1, added by Law No. 64-1245 of 1964.
- 230/ This is what would happen in the United States, according to the calculations of Wollman and Bonem, in their study, The Outlook for Water: Quality, Quantity, and National Growth (1971), pp.20, 68, and 106.
- 231/ United States, Federal Water Pollution Control Act Amendments of 1972, P.L. 92-500, 86 Stat. 816, 33 U.S.C.A., secs. 1250 et seq.
- 232/ These terms were described in congressional debate on the 1972 Act in Congressional Record (daily ed., 4 October 1972), vol. 118, p. S. 16873.
- 233/ France, Code Permanent Environnement et Nuisances, Eau, ch. VII, (Les Agences Financières de Bassin), paras. 158-161 (1975). See also F. Pelissier, Water pollution control in France, in Economic Commission for Asia and the Far East, Proceedings of the 10th Session of the Regional Conference on Water Resources Development in Asia and the Far East (ST/ECAFE/SER.F/44)(1973), p.199.
- 234/ See Johnson and Brown, supra, note 109, pp.42-44.

- 235/ The Colombian Natural Resources and Environmental Protection Code of 1974 (see supra note 226) contains such potential in its art. 314 (i), which envisages conjunctive use of surface, ground and atmospheric waters.
- 236/ See generally F.A. Hatfield, Joint management of ground and surface water, in United Nations, Economic and Social Commission for Asia and the Pacific, Proceedings of the First Session of the Committee on Natural Resources (Water Resources Series No. 46) (1975), pp.84-94.
- 237/ G. Kovacs, The use of ground-water resources in river basin development, Working Paper No. 44, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, 16-26 September, 1975, pp. 15-16.
- 238/ See J. Ineson, Combined use of ground and surface waters, Working Paper No. ESA/RT/AC.1/7, United Nations Panel of Experts on Water Resources Development Policies, Buenos Aires, 8-13 June, 1970, pp. 24-25; F.A. Hatfield, Problem areas and examples of joint management of ground and surface water, in United Nations, Economic and Social Commission for Asia and the Pacific, Proceedings of the First Session of the Committee on Natural Resources (Water Resources Series No. 46) (ST/ESCAP/SER.F/46)(1975), pp.94 and 97; R.S. Harnsberger et al., Groundwater: from windmills to comprehensive public management, Appendix, Nebraska Law Review, vol. 52 (1973), p.284.
- 239/ D.A. Caponera, Water Laws in Moslem Countries (F.A.O. Irrigation and Drainage Paper 20/1)(1973), pp.16-18, 22, and 32-33.
- 240/ Mejjellé Code, arts. 1283 and 1286; Iran, Executive By-law Relating to Prohibitive Areas of Rivers, Ravines, Natural Streams and Irrigation Networks, issued pursuant to Art. 2 of the Water Nationalization Act of 1968.
- 241/ Kenya, Water Ordinance of May 7, 1952, secs. 38 (b) and 74-76; Belgium, Royal Order of June 30, 1958, art. 5 (in polder and wateringue areas); Spain, Canary Islands, Water Use Regulations of January 14, 1965 (up to the effective zone of influence).
- 242/ See Kovacs, supra note 237, pp.10-12 and 15-17; Hatfield, supra note 238, pp.94 and 97; Ineson, supra note 238, pp.14-17. Harnsberger, et al., supra note 238; C.J. Kuiper, Multi-disciplinary approach to conjunctive use of surface and underground waters, paper presented to the International Conference on Global Water Law Systems, Valencia, September 1-9, 1975; F.H. Flint, Groundwater law and administration: a New Mexico viewpoint, Rocky Mountain Mineral Law Institute, vol. 14 (1968), p.545; W.A. Hillhouse II, Integrating ground and surface water use in an appropriation state, Rocky Mountain Mineral Law Institute, vol. 20 (1975), p.691.
- 243/ See Tamir, Legal and Administrative Aspects of the Water Laws in Israel (1975).
- 244/ F.A.O., Groundwater Seminar Granada, 18-23 September 1971, Irrigation and Drainage Paper No. 18, Rome, 1973; D.J. Burdon, D.A. Caponera and J.P. Hrabrovsky, Groundwater's Role in Social and Economic Development, an Example based on FAQ's Near East Regional Activities on Groundwater Development and Use, AGL:Misc/71/8, Rome, 15 April 1971.
- 245/ International Association for Water Law, IInd International Conference on Water Law and Administration, Caracas, 8-14 February 1976, Conference Recommendations As Approved by the Plenary Session on 14 February 1976, No. 16 (b).

- 246/ United States, National Water Commission, Water Policies for the Future (1973), pp.233-235.
- 247/ See W.H. Ellis, Water rights: what they are and how they are created, Rocky Mountain Mineral Law Institute, vol. 13 (1967), p.451.
- 248/ See Kuiper, supra note 242.
- 249/ United Kingdom, Water Resources Board, Report, Water Resources in England and Wales (1973); see also, United Nations, Economic and Social Commission for Asia and the Pacific, supra note 238, p.180.
- 250/ See Fig. 3, Possible joint surface and ground water management structure, in Joint Management of Surface and Ground Water, note by the Government of Indonesia, in United Nations, Economic and Social Commission for Asia and the Pacific, supra note 236, p.183.
- 251/ Hatfield, supra note 238, pp.99-100.
- 252/ See Kuiper, supra note 242, p.37 (Conclusions); Ineson, supra note 238, pp.26-28, which contain a schema of planning stages.
- 253/ This conference, convened by ECA and sponsored by the OAU was held in Addis Ababa, September 13-23, 1971. See Kovacs, supra note 237, p.1.
- 254/ Peru, General Water Act of 1969, art. 2(e).
- 255/ Kuiper, supra note 242, pp.35-36.
- 256/ Tamir, supra note 243, p.33.
- 257/ Rocky Mountain Mineral Law Newsletter, vol. 5, No. 8 (1972), p.3.
- 258/ National Water Commission Report, supra note 246, p.235.
- 259/ See text, supra at note 253.
- 260/ See text, supra at note 245.
- 261/ For example, Dr. Ineson, head of the Ground Water Division of the pre-1973 British Water Resources Board, stated that:

"As with many water resource schemes, flexible planning is necessary so that conjunctive use is considered within a number of water resource options. However, the need for regional ground-water development is recognized, and the advantages of regional basin development with water resources schemes employing conjunctive use have been confirmed."

Ineson, supra note 238, p.17. See also various other authors cited by John W. Harshbarger in "Groundwater Resources Evaluation and Exploitation", Groundwater Seminar Granada, FAO, supra note 244, pp.91-118.
- 262/ See supra note 249.
- 263/ Colombia, National Resources and Environmental Protection Code of 1974, art. 314(i).

- 264/ Ibidem, Art. 312.
- 265/ Ibidem, Art. 313.
- 266/ Florida Statutes Annotated, secs. 373.069 (1) and 373.0693 (1974 and Supp. 1976-77).
- 267/ Ibidem, secs. 373.087, 373.103, and 373.106.
- 268/ Ibidem, sec. 373-042. River basin administration has not been adopted in some other states of the United States where conjunctive use was instituted, In Colorado, for example, a bill providing for basin authorities was passed but never implemented, because such authorities could not be created without the concurrence of the county administrations in the affected areas and this was not forthcoming. Colorado Laws 1969, p.1225, secs. 1-8, Colorado Revised Statutes, secs. 37-93-101 - 37-93-108 (1973); see also Hillhouse, supra note 242, p.707.
- 269/ Israel, Water Law of 1959, arts. 1 and 2.
- 270/ Tamir, supra note 243, p. 9.
- 271/ Peru, General Water Act of 1969, Decree Law No. 17.752, art. 7 (f)(English text in Food and Agricultural Legislation, vol. 19 No. 1, V/4a).
- 272/ This is the so-called Theis formula. Theis, The effect of a well on the flow of a nearby stream, Transactions of the American Geophysical Union, vol. 22 (1941), pp.734-38. See also Flint, supra note 242. The New Mexico system was upheld in a subsequent case in which the Supreme Court of that state held that a surface water right owner might give up his surface right and "trace his water to its source", taking the same amount of water from underground sources feeding the surface flow. Templeton v. Pecos Valley Artesian Conservancy, 65 N.M. 59, 352 P. 2d 465 (1958). Years later, when the city of Albuquerque challenged the power of the state engineer to consider the interrelationship of ground and surface water and to impose on it a schedule of surrender of surface rights, the court upheld the authority of the administration. City of Albuquerque v. Reynolds, 71 N.M. 428, 379 p. 2d 73 (1963).
- 273/ See Hillhouse, supra note 242, p.704.
- 274/ Colorado Revised Statutes, secs. 37-92-301(3), 37-80-120, 37-92-103(9), and 37-92-307 (1973).
- 275/ Ibidem, sec. 37-92-103(9).
- 276/ See supra note 268. However, augmentation plans may be employed by water conservancy and irrigation districts, municipalities and other water supply entities for the benefit of all their users. Colorado Revised Statutes, sec. 37-92-302(5)(1973).
- 277/ Ibidem, sec. 37-92-307. The Colorado regime has not so far been productive of much beyond litigation, but litigation itself in one instance produced a settlement and a stipulation as to rules and regulations for administration of ground and surface rights which was agreed to by both ground and surface users. Kuiper, supra note 242, pp.25-29.
- 278/ See Tamir, supra note 243, pp.31-34 passim.

- 279/ Florida Statutes Annotated, secs. 373.087, 373.106 (1974).
- 280/ Ibidem, sec. 373.087.
- 281/ Environmental Reporter, State Water Laws 621: 0101 et seq. (1973).
- 282/ Pardes Hana v. Ministry of Agriculture, HCJ 221/64, P.D. 18 IV p.533; see also Landau, A problem under the Water Law, Israel Law Review, vol. 2 (1966), p.352.
- 283/ Peru, General Water Act of 1969, art. 7f.
- 284/ See Hatfield, supra note 236, p.90. For this reason, a system of injection wells may be preferred, as in Israel.
- 285/ Water Policies for the Future, supra note 246, Recommendation No. 7-4, p.235.
- 286/ Willcocks, The Nile Reservoir Dam at Aswan and After (1901), pp.13-26; and Irrigation of Mesopotamia (2nd ed. 1917).
- 287/ In his letter accompanying the preliminary report of the Inland Waterways Commission in 1908, President Roosevelt stated:
- "Each river system, from its headwaters in the forest to its mouth on the coast, is a single unit and should be treated as such."
- Four years later, the Final Report of the National Waterways Commission linked the growing demand for water with basin planning:
- "With increasing unity of our national life and the growing necessity of securing for human needs the maximum beneficial use of the water of every stream, it will become increasingly necessary to treat every stream with all its tributaries as a unit."
- S. Doc. No. 325, 60th Cong., 1st Sess. iv (1908); and S. Doc. No. 469, 62nd Cong., 2d Sess. 52 (1912).
- 288/ See Gibson, A review of the water power problem in Great Britain and Ireland, First World Power Conference, Transactions, vol. 1 (1924), pp.376-77.
- 289/ See Arbelot & Dupin, L'évolution des idées en matière de régulation de l'énergie hydraulique, First World Power Conference, Transactions, vol. 2, (1924), pp.148, 153; and Compagnie Nationale du Rhône, Recueil des Textes Constitutifs (1951), p.55.
- 290/ Dozier, Establishing a framework for development in Sardinia: the Campidano, Geographical Review, vol. 47 (1957), p.490, at pp.498-99; Spain, Plan Nacional de Obras Hidraulicas, cited in White, A perspective of river basin development, Law & Contemporary Problems, vol. 22, (1957), at p. 171.
- 291/ Act of March 3, 1925, ch. 467, sec. 3, 43 Stat. 1190. The title "308 Reports" came from the number of the document in which the basins to be surveyed were listed. H.R. Doc. No. 30, 69th Congress, 1st Session (1926).
- 292/ United States, Tennessee Valley Act, Act of May 18, 1933, ch. 32, 48 Stat. 58.
- 293/ See Teclaff, The River Basin, supra note 71, pp.130-32, and 150.

- 294/ River Murray Commission, The development of control of the waters of the River Murray under the River Murray Agreement, United Nations Economic Commission for Asia and the Far East, Regional Technical Conference on Water Resources Development in Asia and the Far East, Proceedings (ST/ECAFE/SER.F/9), p.423 (1956); United Nations Economic Commission for Latin America, Systems of Administrative Organization for the Integrated Development of River Basins (E/CN.12/503)(1959), pp-11 and 40; Wabash Valley Compact, 1959, 73 Stat 696; Delaware River Basin Compact, 1961, 75 Stat. 691.
- 295/ France, Law Concerning the Regime and Distribution of Waters and Protection Against Pollution, December 16, 1964, 47 Bull. Législatif Dalloz 676 (1964); United Kingdom (England and Wales), Water Resources Act, 1963, c. 38, and Water Act, 1973, c. 37; United States, Water Resources Planning Act of 1965, 79 Stat. 244.
- 296/ United Kingdom, England and Wales, Water Act 1973, c. 37, sec. 24 (1)(c).
- 297/ These requirements are laid on them not by the Act itself, but by the Principles and Standards for Planning Water and Related Land Resources promulgated by the Water Resources Council, the coordinating entity established under Title I of the Act. 38 Federal Register 24778 (September 10, 1973).
- 298/ See England and Wales, Water Act 1973, sec. 3; FAO. Water Law in Selected European Countries (Legislative Study No. 10)(1975), pp.75-76 (France); and H.P. Caulfield, Jr., The conciliar approach to organization for water resources planning within a federal system of government, in United Nations, Proceedings, Interregional Seminar on Water Resources Administration, New Delhi, 22 January-2 February 1973 (DP/UNT/INT-70-371)(1975), p.113, at pp.117-18.
- 299/ United Kingdom, England and Wales, Water Act, 1973, c. 37, sec. 24 (8).
- 300/ See Caulfield, supra note 298, pp. 117-18.
- 301/ Water 1973, sec. 1.
- 302/ FAO, supra note 298, pp.72 and 76.
- 303/ See supra, note 297.
- 304/ See Tamir, supra note 243, p.80; and United Nations, Department of Economic and Social Affairs, National Systems of Water Administration (ST/ESA/17)(1974), pp.34-35, and 136.
- 305/ See S. Martin-Retortillo, Water resources administration in Spain, in National Systems of Water Administration, supra note 304, pp.174-75.
- 306/ See L. David, Water management administration in Eastern Europe, in United Nations, Interregional Seminar on Water Resources Administration, supra note 298, pp.126-128; and I.Z. Balló and K. Szesztay, Water resources administration in Hungary, in National Systems of Water Administration, supra note 304, pp.98-100.
- 307/ David, supra, p. 128.
- 308/ International Association for Water Law, II International Conference on Water Law & Administration, Caracas, 8-14 February, 1976, Conference Recommendations, No. 34.

- 309/ See supra note 297.
- 310/ See in particular:
Food and Agriculture Organization, Farm Water Management Seminar, Manila, 7-16 October 1970, Irrigation and Drainage Paper No. 12, Home, 1972, pp. 219-229 and 243-253. See also, Food and Agriculture Organization, Water Law in Selected European Countries, Vol. I, Legislative Studies No. 10, Rome, 1975, pp.19-21 (Belgium: wateringue and polder), p. 47 (England and Wales: internal drainage districts), p.78 (France: irrigation cooperatives, combined drainage associations and combined fishing associations), pp. 107-108 (Israel: consumers representations and "planned settlement"), pp.152-153 (Italy: free and compulsory water users' associations, land reclamation, waterworks, fish resources protection and industrial development associations), pp. 201-205 (Spain: communities of irrigators, general communities, central syndicates, joint water supply, waste disposal and groundwater users' associations) and p. 247 (Turkey: customary associations of Karez users); Food and Agriculture Organization, Legislación de las aguas en América Central, Caribe y Mexico, Vol. I, Legislative Studies No. 8, Rome, 1975; and Water Laws in Moslem Countries, supra note 11.
- 311/ T. Scudder, Social impacts of integrated river basin development on local populations, Working Paper No. 30, in UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, 16-26 September 1975.
- 312/ International Council of Scientific Unions, Scientific Committee on Problems of the Environment, Man-Made Lakes as Modified Ecosystems (1972), p.16.
- 313/ R.H. Wilson, Toward a Philosophy of Planning: Attitudes of Federal Water Planners (EPA-R5-78-015)(1973), p-ix.
- 314/ United States, National Environmental Policy Act, 83 Stat. 852, 42 U.S.C. secs. 4321 et seq. (1970).
- 315/ Principles and Standards, supra note 297, Part V, B3, 38 Fed. Reg. 24778 (96) (1973).
- 316/ J.W. Willett. ed., The World Food Situation: Problems and Prospects to 1985, vol. 1 (1976), p.83.
- 317/ S.M.H. Bokhari, Ex-post evaluation of river basin developments in Pakistan, Working Paper No. 22, p.1, for UNDP/UN Interregional Seminar on River and Interbasin Development, Budapest, 16-26 September 1975.
- 318/ On user's associations, see Teclaff, Abstraction and Use of Water, supra note 13, p.116 et seq. On user participation in cropping and irrigation plans, see for example, Peru, General Water Act of 26 July 1969 (Decree Law No. 17.752)(English text in Food and Agricultural Legislation, vol. XIX, No. 1 V/4a). Art 44 provides that:
"The Water Authority, in coordination with the Water Users' Board and the authorities of the agricultural district in question, shall prepare cropping and irrigation plans..."
- 319/ United Kingdom, England and Wales, Water Act 1973, c. 37, sec. 18.
- 320/ United Nations, Department of Economic and Social Affairs, Integrated River Basin Development (rev. ed. 1970)(E/3066/Rev. 1), p.12.

321/ See supra note 297.

322/ For example, they require that:

"To facilitate comparisons and tradeoffs among alternative plans and comparisons of beneficial and adverse effects measured in nonmonetary terms with beneficial and adverse effects measured in monetary terms, one alternative plan should be formulated in which optimum contributions are made to the component needs of the national economic development objective. Additionally, during the planning process at least one alternative plan will be formulated which emphasizes the contribution to the environmental quality objective. Other alternative plans reflecting significant tradeoffs between the national economic development and environmental quality objectives may be formulated so as not to overlook a best overall plan."

38 Federal Register 24778 (100-106)(September 10, 1973)

323/ Ibidem, (102-103).

324/ United Nations, Economic Commission for Asia and the Far East, A Case Study of the Comprehensive Development of the Kitakami River Basin (Flood Control Series No. 20)(ST/ECAFE/Ser. F/20)(1962).

325/ G. Macinko, The Columbia basin project reappraised, Working Paper No. 24, in UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, 16-26 September 1975.

326/ Ibidem, p.16.

327/ H. Finkel, Human obstacles to the control of the hydrological cycle for the benefit of man, in Man's Influence on the Hydrological Cycle (FAO Irrigation and Drainage Paper, No. 17)(1973), p.66.

328/ Bokhari, supra note 317.

329/ Ibidem, p.19.

330/ W.R. Derrick Sewell, Administrative responses to the changing role of water-resources planning, in UNDP Interregional Seminar on Water Resources Administration, New Delhi, 22 January-2 February 1973 (DP/UN/INT-70-371), Proceedings (1975), p.48, et p.55.

331/ Bokhari, supra note'317, p.24.

332/ United States, National Environmental Policy Act, 83 Stat. 852, 43 U.S.C. secs. 4321 et seq. (1970).

333/ See, e.g., Sierra Club v. Froehlke, 359 F. Supp. 1289 (1973).

334/ Council on Environmental Quality, Preparation of Environmental Impact Statements: Guidelines, 38 Federal Register, 20550-62 (August 1, 1973). In Environmental Defense Fund v. Corps of Engineers, the court declared bluntly that:

"Where experts, or concerned public or private organizations, or even ordinary lay citizens bring to the attention of the responsible agency environmental impacts which they contend will result from the proposed agency action, then the... statement should set forth these contentions and opinions, even if the responsible agency finds no merit in them whatsoever."

Environmental Defense Fund v. Corps of Engineers, 325 F. Supp. 749, 759 (1971).

335/ Council on Environmental Quality, Guidelines, supra secs. 1500.9(d) and 1500.10(a).

336/ Sierra Club v. Morton, 405 U.S. 727 (1972).

337/ Canada, Province of Ontario, Environmental Assessment Act, 1975, ch. 69, sec. 18 (19).

338/ Australia, Environment Protection (Impact of Proposals) Act, Act No. 164 of 17 December 1974, sec. 10. But under the Administrative Procedures promulgated under the Act, the impact statement may be suppressed entirely as far as public comment goes, at the Minister's discretion. Australia, Governor-General, Order under Sub-section 6(1) of the Environment Protection (Impact of Proposals) Act 1974-1975, 20 June 1975, para. 6.2.4.

339/ Ontario, Environmental Assessment Act, supra, secs. 7 (1)(b), 7(2)(a), and 8.

340/ Colombia, National Code on Renewable Natural Resources and Environmental Protection (enacted by Decree No. 2811 of December 18, 1974), art. 337, 11 Diario Oficial 145 (2 January 1975).

341/ Teclaff, Abstraction and Use of Water, supra note 13, pp.116-26, and 200-01.

342/ Salta (Argentina), Código de Aguas, 1946, arts. 265, 324 and 332-333? and Cano and Vargas Galindez, Leyes de Aguas en Sudamérica, pp.150-151.

343/ See B.J. Wohlwend, Hindu Water Law and Administration in Bali, paper presented at International Conference on Global Water Law Systems, Valencia, September 1975.

344/ See V. Giner, Las Comunidades de Regantes y el Tribunal de Las Aguas de Valencia, in International Association for Water Law, IInd International Conference on Water Law A Administration, Caracas, 8-14 February 1976, Working Papers, vol. 9, p.801 et seq.

345/ Teclaff, Abstraction and Use of Water, supra note 13, pp.122-24.

- 346/ United Kingdom, England and Wales, Water Act 1973, c. 37, sec. 3. The water authorities are thus "by no means uniform in character or composition. To compare, for example, the Northumbrian and Anglian entities: the former, which includes the urban and heavily industrialized Tyneside area, consists of nineteen members, of whom eight, plus the chairman, are appointed by the administration. The metropolitan county of Tyne and Wear appoints two, and the three non-metropolitan counties one each. The five metropolitan districts are represented by two members between them. The Anglian Authority, which takes in a much larger but more rural area, has thirty-five members, of whom seventeen, including the chairman, are appointed by the administration. The eighteen members appointed by local authorities represent nine counties (one member each) and sixty-six districts. United Kingdom, Statutory Instruments, Water, England and Wales, 1973 No. 1288, The Northumbrian Water Authority Constitution Order of 25 July 1973, and 1973 No. 1359, The Anglian Water Authority Constitution Order of 31 July 1973.
- 347/ United Kingdom, Department of the Environment, Reorganisation of Water and Sewage Services; Government Proposals and Arrangements for Consultation (Circular 92/71)(2 December 1971), Explanatory Memorandum, para. 43.
- 348/ France, Law No. 64-1245 of 16 December 1964, art. 13. See also, R. Johnson and G. Brown, Comprehensive management and effluent charge systems in European water management, in International Association for Water Law, IInd International Conference on Water Law and Administration, Caracas, 8-14 February 1976, Working Papers, vol. 7, p.613.
- 349/ Johnson and Brown, supra, p. 626.
- 350/ England and Wales (United Kingdom), Water Resources, (Licenses) Regulations, 1965, Statutory Instruments No. 534 (1965), pp.1479 et seq.; Kenya. Water Ordinance of 7 May 1952, secs. 78-88, Laws of Kenya rev. ed. (1962), chap. 372; Nevada Revised Statutes (1975), secs. 533.335-533.370.
- 351/ Kenya, Water Ordinance of 7 May 1952, secs. 78-88; Nevada Revised Statutes (1975), secs. 533.335-533.370.
- 352/ Kenya, Water Ordinance of 7 May 1952, secs. 78-88; California Water Code (1971), sec. 1250 et seq.
- 353/ France, Code du Domaine Public Fluvial, art. 33; Law No. 64-1245 of 16 December 1964, on the Regime and Distribution of Waters and Protection Against Pollution, art. 47.
- 354/ See W. Tarasiewicz, Przepisy Prawne w Gospodarce Wodnej (1975), pp.87-88.
- 355/ The Water Resources Act of 1963, sec. 39, permits appeal from the decisions of the river (now water) authorities concerning the granting of licenses to be made to the Minister, whose decision is final. An appeal to the Minister may not be questioned in any legal proceedings whatsoever, unless that decision is not within the powers of the act, or the requirements of the act have not been complied with. Ibidem, sec. 170(1). These provisions have not been repealed by the 1973 Water Act.
- 356/ France, Decree of 30 September 1953, on Administrative Tribunals, Sirey législation, p. 1436. But complaints concerning excesses of power are entrusted to the Council of State.

- 357/ Spain, Law of Waters of 13 June 1879, art. 244; Chile, Código de Aguas, 1951, arts. 138 and 141; Argentina, Mendoza, Constitución (1949), arts. 246-247, and Salta, Código de Aguas, 1946, arts. 265, 324, and 332-333? Italy, Royal Decree No. 1775 of 1933 (Testo Unico), arts. 139-143; South Africa, Water Act, Act No. 54 of 1956 (as amended), secs. 35-55; Israel, Water Law No. 5719-1959 of 3 August 1959, secs. 141-147.
- 358/ See Rosenberg & Makarchuk v. Grand River Conservation Authority and the Corporation of the County of Wellington, Canadian Environmental Law News, vol. 5, p.39, at p.45 (April 1976). See also, concerning Australia, Benjafield and Whitmore, Principles of Australian Administrative Law (1971), p.224.
- 359/ Sierra Club v. Morton, 405 U.S. 727 (1972).
- 360/ See possible signs of relaxation of the rule of standing in Thorson v. Att'y General of Canada, (1974) N.R. 25, 43 D.L.R. (3rd) 1974, as noted by Lucas, Legal foundations for public participation in environmental decision-making, Natural Resources Journal, vol. 16 (1976), pp.72, 95, 97.
- 361/ As in some provinces of Argentina, in Bolivia, and India. Mendoza. Arg., Constitution of 4 June 1949, art. 244, Anales de legislación (1949), p.2475; Bolivia, Law of 9 January 1945, concerning the Angostura-Chochabamba Irrigation Scheme, art. 8. See also G.J. Cano and F.F. Vargas Galindez, Las Leyes de Aguas en Sudamérica (F.A.O. Agricultural Development Papers No. 56)(1956), pp.16-19, 107-08, 113-16, 196-98, and 200. On India, see generally, L. Teclaff, Abstraction and Use of Water, supra note 13, pp.93-94.
- 362/ South Australia, Irrigation Act, 1930-1946, secs. 70 and 72.
- 363/ Chile, Act No. 16,640 of 16 July 1967 on Land Reform, Diario Oficial No. 26,804 (28 July 1967), p.2713. Art. 172 established the norm as 80 "basic hectares of irrigated land", but a landowner already irrigating more than that amount with efficient techniques and complying with certain other requirements could irrigate up to 320 "basic hectares".
- 364/ See United Nations, Economic and Social Commission for Asia and the Pacific, Proceedings, 1st Session of the Committee on Natural Resources (Water Resources Series No. 46)(1975), p. 132.
- 365/ See United Nations, Economic Commission for Asia and the Far East, A Case Study of the Comprehensive Development of the Kitakami River Basin (Flood Control Series No. 20)(1962), pp.37-38.
- 366/ France, Compagnie Nationale d'Aménagement de la Région du Bas-Rhône et du Languedoc, Recueil des textes constitutifs (1962), pp.49-50.
- 367/ United States, Colorado River Basin Project Act, 43 U.S.C. sec. 1524 (c).
- 368/ South Australia, Irrigation Act, 1930-46, secs. 58 and 59.

- 369/ See, e.g., Portugal, Decree No. 47, 153 of 18 August 1966, issuing the regulations governing Irrigators' and Beneficiaires Associations. Art. 34 (2) on duties of members states that they must care for, maintain and repair irrigation works, or any part thereof, on their holdings whenever the board of management of the association orders them to do so. Under El Salvador's Irrigation and Drainage Act of November 17, 1970, sec. 40(c), users have the obligation:
- "...to make proper use of and apply efficiently the irrigation water supplied to them, and to avoid loss of water to the detriment of other users or damage to structures and other works belonging to the district."
- 370/ U.S.S.R., R.S.F.S.R. Water Code, 1972, art. 38.
- 371/ U.S.S.R., R.S.F.S.R. Law on Nature Conservation, 1960, art. 4(b).
- 372/ Burma, Canal Act, Act No. 2 of 1905 (as amended), sec. 39; text in Burma Code, 4th ed. (1910), pp.505 et seq.
- 373/ See, e.g., Blaine County Inv. Co. v. Mays, 49 Idaho 776, 291 P. 1055 (1930), in which the Idaho Supreme Court upheld a lower court decision that it was not a beneficial use to flood land in the winter so as to form a cap of ice that would help to retain soil moisture into the growing season; also Enterprise Irr. Dist. v. Willis, 135 Nebr. 827, 284 N.W. 326 (1939), in which it was found that prevailing customs and methods of applying water to the land were to be observed and not the latest and most approved scientific method.
- 374/ For example, this varies in different states from two-and-a-half to five acrefeet of water per acre per year and is usually so stated in the statutes as the maximum permissible amount. California Water Code, sec. 1004 (1971); Idaho Code Annotated, sec. 42-202 (Supp. 1976); Nebraska Revised Statutes, sec. 46-231, 46-242 (1974); South Dakota Compiled Laws, sec. 46-5-6 (1967 and Supp. 1976); Wyoming Statutes Annotated, secs. 41-181 - 41-188 (1957).
- 375/ See, e.g., Chile, Act No. 16,640 of 1967, art. 106; Peru, Act No. 15037 of 1964, art. 114; Iran, Water Law of 18 July 1968 and the Manner of Water Nationalization, art. 17.
- 376/ E.g., California Administrative Code, tit. 23, sec. 655 (1974), Kansas Statutes Annotated, sec. 42-302 (1973); Nevada Revised Statutes, sec. 533.070 (1973).
- 377/ Colombia, Decree No. 182 of 12 February 1968, sec. 13.(But this is not absolutely mandatory; it is at the discretion of the management of an irrigation district.) Peru, General Water Act of 1969, sec. 11, obligates water users to install control and metering devices, and sec. 91 gives top priority to ensuring the adequacy of facilities for the metering of water for agricultural purposes. Metering of groundwater is, for example, required in Israel (Drilling Regulations of 20 October 1955, issued under the Water Drilling Control Law of 1955, sec. 10) and in Iran (Water Nationalization Law, 18 July 1968, art. 33).
- 378/ El Salvador, Irrigation and Drainage Act, 1970, sec. 56.
- 379/ See 43 U.S.C.A. 504 (rehabilitation and betterment); 7 Code of Federal Regulations 701.1 (a), 101.71 - .82 (1972)(rural environmental assistance); and 7 Code of Federal Regulations 1823.57 (1972)(farmers' home administration program).

- 380/ Spain, Law of 7 July 1911 on the construction of hydraulic works, as amended, art. 13. As a general rule, works which irrigate an area of not less than 200 hectares are considered principal and therefore eligible for assistance; the owners of the land or the irrigation associations are responsible for lesser works.
- 381/ See, e.g., Salt River Valley Water Users' Association v. Kovacovich, 3 Ariz.App. 28, 411 P. 2d 201 (1966), in which a farmer salvaged water by lining his ditch and eradicating water-consuming weeds, but was not allowed to use this salvaged water on other land.
- 382/ Wyoming Laws, 1974, ch. 23, Wyoming Statutes, sec. 41-4.1 (1975 Supplement).
- 383/ United States, National Water Commission, Water Policies for the Future (1973), p.302.
- 384/ See, e.g., Argentina, Santiago del Estero, Water Code, art. 262; Jujuy, Water Code, sec. 196; Salta, Water Code, art. 195; and Mendoza, Constitution, art. 256. Also Bolivia, Water Law, sec. 247.
- 385/ See C.J. Cano and F.F. Vargas Galindez, Las Leyes de Aguas en Sudamérica, supra note 361, pp.79 and 174-75.
- 386/ Colombia, National Code on Renewable Natural Resources and Environmental Protection (enacted by Decree No. 2811 of 18 December 1974), arts. 92-95; Poland, Water Law of 24 October 1974, art. 33.
- 387/ The Kenya Water Ordinance of 1952, sec. 98(2), provides that where any community and any association of operators submits a scheme for better storage, distribution, and utilization of water resources in any area and that scheme is approved by the Water Apportionment Board, any operator in that area may have his license or permit cancelled, amended or revised.
- 388/ Spain, Código Civil, 1 May 1889, art. 441; Chile, Act No. 16,640 of 1967, sec. 109(1a); Poland, Water Law of 30 May 1962, art. 57; Peru, Act No. 15037 of 1964, art. 111.
- 389/ For a discussion of these laws, see Teclaff, Abstraction and Use of Water, supra note 13, pp.217-19.
- 390/ See supra note 386.
- 391/ The texts of all these treaties may be found in United Nations Legislative Series, Legislative Texts and Treaty Provisions Concerning the Utilization of International Rivers for Other Purposes than Navigation (ST/LEG/SER.B/12) (1964), at pp.736, 550, 776, and 672 respectively.
- 392/ Agreement between the United Arab Republic and the Republic of Sudan for the Full Utilization of the Nile Waters, 8 November 1959, and Protocol concerning the establishment of the Permanent Joint Technical Committee, 17 January 1960, text in Legislative Texts and Treaty Provisions, supra at p.143.
- 393/ Indus Waters Treaty between the Government of India, the Government of Pakistan, and the International Bank for Reconstruction and Development, 19 September 1960, text in ibidem, p.300.

- 394/ Treaty relating to cooperative development of the water resources of the Columbia River Basin, signed at Washington, D.C., 17 January 1961, entered into force 16 September 1964, with related agreements affected by exchange of notes at Washington, 22 January 1964, and at Ottawa, 16 September 1964. 15 U.S.T. 1555; TIAS 5638; 542 UNTS 244.
- 395/ J. Andrassy, *Les relations internationales de voisinage*, Académie de Droit International, Recueil des Cours, vol. 2 (1951), pp.77-181; H. Lauterpacht, The Function of Law in the International Community (1933), pp.290-95 *passim*.
- 396/ Seventh International Conference of American States, Declaration on Industrial and Agricultural Use of International Rivers, 1933 (text in American Journal of International Law, vol. 28 (Supp. 1934), p.59. The Declaration stated in Art. 2 that:
- "...no state may, without the consent of the other riparian state, introduce into water courses of an international character, for the industrial or agricultural exploitation of their waters, any alteration which may prove injurious to the margin of the other interested state."
- 397/ The Arbitral Tribunal said:
- "But international practice does not so far permit more than the following conclusion: the rule that States may utilize the hydraulic power of international watercourses only on condition of a prior agreement between the interested States cannot be established as a custom, even less as a general principle of law.
- It is for each State to evaluate in a reasonable manner and in good faith the situations and the rules which will involve it in controversies; its evaluation may be in contradiction with that of another State; in that case, should a dispute arise the Parties normally seek to resolve it by negotiation or, alternatively, by submitting to the authority of a third party; but one of them is never obliged to suspend the exercise of its jurisdiction because of the dispute except when it assumes an obligation to do so.
- The Tribunal is of the opinion that, according to the rules of good faith, the upstream State is under the obligation to take into consideration the various interests involved, to seek to give them every satisfaction compatible with the pursuit of its own interests, and to show that in this regard, it is genuinely concerned to reconcile the interests of the other riparian State with its own."
- Lake Lanoux Case (France v. Spain), 24 I.L.R. 101, 130, 132, 138-39 (1957).
- 398/ Institute of International Law, Utilization of Non-Maritime International Waters, Resolution adopted at Salzburg, 3-12 September 1961, arts. 2 and 3, Annuaire de l'Institut de Droit International, vol. 49(2)(1961), p.370.
- 399/ International Law Association, Helsinki Rules on the Uses of the Waters of International Rivers, art. IV, Report of the 42nd Conference held at Helsinki, 17-20 August 1966, (1967), pp.477-522.

- 400/ Report of the International Joint Commission (United States and Canada) on the Pollution of Boundary Waters 169-170 (1950, summarized in Lester, Pollution, in Garretson et al., eds. The Law of International Drainage Basins (1967), p.89, at pp.104-05.
- 401/ Convention of April 29, 1963, between France, the Federal Republic of Germany, Luxembourg, the Netherlands, and Switzerland, (1963) Tractatenblad van der Koninkrijk der Nederlanden, No. 104; text also in (1974) Beiträge zur Umweltgestaltung B7, Internationales Umweltrecht - Multilaterale Verträge, No. 963; 31/1; see also Brown, The conventional law of the environment, in Teclaff and Utton, eds., International Environmental Law (1974), pp.25, 35.
- 402/ United States-Canada, Great Lakes Water Quality Agreement, 15 April 1972, 23 U.S.T. 301, T.I.A.S. 7312, International Legal Materials, vol. 11 (1972), p.694.
- 403/ Recommendation 159 in United Nations Doc. A/CONF.48/7, Environmental Aspects of Natural Resources Management, Subject Area II, F, Considerations for Action.
- 404/ The original recommendation (Recommendation 159) stated:
- "That nations agree that when water resources activities are contemplated that may have an environmental effect on another country, the other country be notified well in advance of the activity envisaged."
- In the course of the Conference this was modified by the words "when appropriate" (amendment contained in A/CONF.48/C.2/CRP.14), so that it established no legal duty.
- 405/ United Nations, General Assembly Resolutions 3129 (XXVIII)(15 January 1974), International Legal Materials, vol. 13 (1974), p.232; and General Assembly Resolution 3281 (XXIX)(15 January 1975), International Legal Materials, vol. 14 (1975), p. 251. The former states that:
- "Cooperation 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 within the framework of the normal relations existing between them."
- The latter proclaims that:
- "In the exploitation of natural resources shared by two or more countries, each state must cooperate on the basis of a system of information and prior consultations in order to achieve optimum use of such resources without causing damage to the legitimate interest of others."
- 406/ United Nations, General Assembly, Report of the United Nations Conference on the Human Environment held at Stockholm, 5-16 June 1972 (United Nations Doc. No. A/CONF.48/14), p.38.
- 407/ Ibidem, p.7.

- 408/ Organization for Economic Co-Operation and Development, Council Recommendations on Principles Concerning Transfrontier Pollution, 14 November, 1974, Annex Titles C and D, International Legal Materials, vol. 14 (1975), p.242; Convention on the Protection of the Environment between Denmark, Finland, Norway, and Sweden, 19 February 1974, International Legal Materials, vol. 14 (1974), p.591.
- 409/ Article 3 of the Convention states that:
- "Any person who is affected or may be affected by a nuisance caused by environmentally harmful activities in another Contracting State shall have the right to bring before the appropriate Court or Administrative Authority of that State the question of the permissibility of such activities, including the question of measures to prevent damage, and to appeal against the decision of the Court or the Administrative Authority to the same extent and on the same terms as a legal entity of the State in which the activities are being carried out.
- The provisions of the first paragraph of this Article shall be equally applicable in the case of proceedings concerning compensation for damage caused by environmentally harmful activities. The question of compensation shall not be judged by rules which are less favourable to the injured party than the rules of compensation of the State in which the activities are being carried out."
- International Legal Materials, vol. 13 (1974), p.592.
- 410/ United Kingdom-United States, Boundary Waters Treaty, 11 January 1909, arts. 3, 4 and 8, text in United Nations, Legislative Texts and Treaty Provisions, supra note 391, p.260.
- 411/ United States-Canada, Great Lakes Water Quality Agreement, art. 6, supra note 402.
- 412/ Statute of the Committee for Co-ordination of Investigations of the Lower Mekong Basin, Established by the Governments of Cambodia, Laos, Thailand and the Republic of Viet-Nam in Response to the Decision Taken by the United Nations Economic Commission for Asia and the Far East, done at Phnom-Penh on 31 October 1957, text in United Nations Legislative Series, supra note 391. p.267.
- 413/ Ibidem, Article 4.
- 414/ Committee for Coordination of Investigations of the Lower Mekong Basin (Laos, Democratic Kampuchea, Thailand and the Republic of Viet-Nam), Mekong Secretariat, United Nations Economic Commission for Asia and the Pacific, Bangkok, Thailand, Joint Declaration of Principles for Utilization of the Waters of the Lower Mekong Basin, 31 January 1975.
- 415/ See Amendement à la convention portant création de l'Organisation pour la Mise en Valeur du Fleuve Sénégal, signed December 1975 in Nouakchott (OMVS, Secrétariat Général, Dakar, Sénégal).

- 416/ For a detailed discussion of the composition, powers and duties of the OMVS, see T. Parnall and A.E. Utton, The Senegal Valley Authority: A Unique Experiment in International River Basin Planning, Indiana Law Journal, vol. 51 (1976), p.235. See also D.A. Caponera, Rapport au Secrétariat Général de l'OMVS sur le droit et l'administration internationale des eaux, Dakar et Nouakchott, 4-29 Mai 1974, FAO/WS/FI077, p.5.
- 417/ See generally on international water administration, D.A. Caponera, Administration of International Water Resources, in International Law Association, Madrid Conference (1976), International Water Resources Law, Report of the Committee, p.9 et seq.