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WATER POLLUTION CONTROL BY AGREEMENT: THE FRENCH SYSTEM OF CONTRACTS*

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Water pollution problems plague all nations, especially those in which industrialization and urbanization are expanding rapidly. They are particularly acute in Western Europe where many of the river systems are relatively small and heavy concentrations of population and industry dispose of massive quantities of effluents, some of which are highly toxic. Recognition of these problems and the need for remedial action led to bold new approaches in water management in several European countries during the mid 1960s, most notably the United Kingdom and France. It is now 15 years since the initial moves were made, sufficient time for an evaluation.

The focus in this paper is on the experience in France. Although a good deal has been written about developments in the United Kingdom, relatively little has appeared, in the English language at least, on innovations in France. Since France was the first country to adopt effluent discharge fees on a nation-wide basis, a discussion of the latter should be of interest not only to those concerned with the principles underlying such charges but also to those involved in water management generally.

While the literature to date has considered the costs of pollution and the benefits of reducing it, much less attention has been given to the costs of introducing various measures to attain water quality improvements. In particular, the costs of monitoring or administering various strategies are seldom taken into account. This is a particularly important consideration in the French system of effluent discharge fees and in the policy of voluntary agreements between government and major polluters known as *contrats de branche* (sectoral contracts or voluntary agreements).

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MECHANISMS FOR ABATING WATER POLLUTION

The introduction of hazardous or polluting effluents into water bodies is a clear case of negative externality or environmental spillover.[1] Polluters effectively reduce their private costs by taking advantage of "free goods."[2] The difficulty with such goods, especially those which take the form of a common property, is that their use by one individual or group can effectively reduce the potential use by another.[3] The problem is how to reduce such external effects in a manner which is effective, efficient and equitable.

In theory it is normally accepted that a production externality can be reduced by imposing a charge equal to the difference between marginal private costs to the producer and marginal social costs caused by him.[4] Such "Pigovian taxes" pose several problems, notably: a) the identification and measurement of the marginal relations involved, b) the establishment of a correct level of taxes, and c) the creation and cost of an efficient administrative system to levy the taxes. The latter is a particularly important, but often neglected consideration. Any adaptive mechanism involves transaction and administrative costs associated with implementing a pollution control strategy.[5] To attain efficiency the marginal net benefit of intervention must be at least equal to (and preferably less than) the marginal transaction costs. In instances of producer-product externalities such costs may be minimized.[6] Most environmental problems, however, involve many actors, some of whom are in the form of latent groups with no

1. Mishan, *The Postwar Literature on Externalities: an Interpretive Essay*, 9 J. ECON. LITERATURE 1 (1971).

2. Strictly speaking, free goods do not exist since there is necessarily some form of opportunity cost and acquisition cost involved in the consumption of any good. Implied here is the idea that the cost of production is effectively zero. *See* Head & Shoup, *Public Goods, Private Goods and Ambiguous Goods*, 79 ECON. J. 567 (1969).

3. Common properties have been identified in various resource systems, most notably in the fishery. For a recent discussion, see Juergensmeyer & Wadley, *The Common Lands Concept: A "Commons" Solution to a Common Environmental Problem*, 14 NAT. RES. J. 361 (1974). *See also* Ciriacy-Wantrup & Bishop, *"Common Property" as a Concept in Natural Resources Policy*, 15 NAT. RES. J. 713 (1975); Anderson, *The Relationship between Firm and Fishery in Common Property Fisheries*, 52 LAND ECON. 179 (1976).

4. ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD), THE POLLUTER PAYS PRINCIPLE (1975). *See also* Ferrar & Whinston, *Taxation and Water Pollution Control*, 12 NAT. RES. J. 307 (1972).

5. Transaction costs are assumed to include all administrative and product costs associated with preparing, arriving at, and monitoring a set of agreements. For a discussion of the costs of intervention, see Kreir & Montgomery, *Resource Allocation, Information Cost and the Form of Government Intervention*, 13 NAT. RES. J. 89 (1973).

6. It can be argued that since the firm is an organization aimed at internalizing certain advantages (especially economies in production), it is equally organized to externalize certain costs. Intra-firm externalities are seen to exist in a structured organizational framework which is amenable to their efficient control. *See* Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937).

formal structure,[7] and simple organizational solutions are not possible. Complex management arrangements become necessary not so much because of the difficulty of internalizing negative external effects, but rather because of the fragmented pattern of resource user groups.

Various mechanisms have been employed to help abate the negative effects of water pollution.[8] Some are purely legal in nature because the judiciary decides questions of blame. This is not surprising, since negative externalities normally usurp a third party's traditional, acquired or legislatively defined rights. What is argued at law, however, is not necessarily coincidental with the *efficient* use of resources, since blame may be based on compliance rather than need. Other mechanisms are administrative, such as discharge permits or even straight prohibition of effluents. Levels of pollution allowed in the permits may be coordinated with various administrative objectives and clearly defined *standards,* but may not be directly related to the relative contribution to ambient pollution made by a particular activity. It might be noted that the definition of acceptable standards creates a right to pollute up to the permitted level. The standard then becomes a threshold and the polluter is allowed to use the assimilative capacity of the water body at no charge up to that point.

In addition to legal and administrative mechanisms, incentives and disincentives can be applied to pollution producers. Incentives range from tax benefits to free advice; disincentives are normally in the form of charges applied directly to each polluter.[9] Charges can have a widely differing impact depending on the economic viability of each polluter. Other economic tools include subsidies and direct grants to help with purchasing pollution control equipment.[10]

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7. A latent group (as opposed to an "elite" such as the firms mentioned in footnote 6) involves a great number of individuals, none of whom has the incentive to organize a coordinated reaction to threat. *See* A. DOWNS, AN ECONOMIC THEORY OF DEMOCRACY (1957).

8. *See* Mishan, *supra* note 1, who proposed various strategies for externality control (or internalization). For a discussion of measures to reduce water pollution, *see* OECD, *supra* note 4. *See also* Fisher & Peterson, *The Environment in Economics: A Survey,* 14 J. ECON. LIT. 1 (1976).

9. A strict interpretation of the "polluter pays principle" would imply some form of direct charge. It is not clear, however, whether these charges are "prices," "taxes," or simple "fees." Since charging rates are frequently nominal, there is little relationship to any strict pricing system. *See* Teitenberg, *Specific Taxes and the Control of Pollution: A General Equilibrium Analysis,* 87 Q.J. ECON. 503 (1973); ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD), POLLUTION CHARGES: AN ASSESSMENT (1976).

10. Incentives produce distortions (both desirable and undesirable) in the economic system. *See* Bramhall & Mills, *A Note on the Asymmetry between Fees and Payments,* 2 WATER RESOURCES RESEARCH 615 (1966); Bohm, *Pollution: Taxation or Purification?* 25 KYKLOS 501 (1972).

Each type of intervention mechanism has its particular advantages and drawbacks. Most of these have been discussed in some detail elsewhere.[11] It is frequently pointed out that the application of Pigovian taxes implies the "polluter should pay." This is counterbalanced by the argument that most control mechanisms, with the exception of certain specific pollution fees, directly contradict this principle.[12] This is certainly true for pollution control equipment subsidies which could act as disincentives to reduce pollution at the source and represent a net transfer from the public purse to the polluter. Control mechanisms, however, are rarely used in isolation since most water pollution management and control systems are an amalgam of new and historical approaches. Institutional evolution by accretion (and often by demise) means that many different mechanisms exist at the same time. Even if massive and sudden institutional change becomes possible, it is frequently politically wise to avoid putting all one's eggs in one basket. A certain amount of inefficiency is thus guaranteed but it may be off-set by the value of certainty and predictability. Should the marginal value of an institutional change be less than the marginal level of instability created by that change, the *status quo* may be the efficient solution.

THE COSTS OF POLLUTION CONTROL: A BASIS FOR VOLUNTARY AGREEMENT

All the above mechanisms involve transaction costs: setting up an administrative system, defining standards and fee levels, and implementing and enforcing the mechanism. Some costs are fixed; others, variable.[13] As a system of intervention approaches the complexity of the real world, the greater the transaction costs involved (Figure 1). A case in point may be the levying of accurate pollution fees: the closer the system gets to monitoring each individual source of pollution on a continual basis and applying actual as opposed to average charges, the greater the costs. Even a minimal level of monitoring accuracy involves some transaction costs (OT), but only the smallest amount of pollution fees is collected (OP). Figure 1 supposes that a

11. *See* notes 8, 9, and 10, *supra*. *See also* Baumol & Oates, *The Use of Standards and Prices for Protection of the Environment*, 73 Swedish J. ECON. 42 (1971); Baumol, *On Taxation and the Control of Externalities*, 62 AM. ECON. REV. 307 (1972).

12. *See* OECD, *supra* note 4; Forsund, *The Polluter Pays Principle and Transitional Period Measures in a Dynamic Setting*, 77 SWEDISH J. ECON. 56 (1975).

13. The high cost and importance of information for decision-making cannot be ignored when considering fixed and variable costs. *See* Lord & Warner, *Aggregates and Externalities: Information Needs for Public Natural Resource Decision-Making*, 13 NAT. RES. J. 106 (1973); Ingram, *Information Channels and Environmental Decision Making*, 13 NAT. RES. J. 150 (1973).

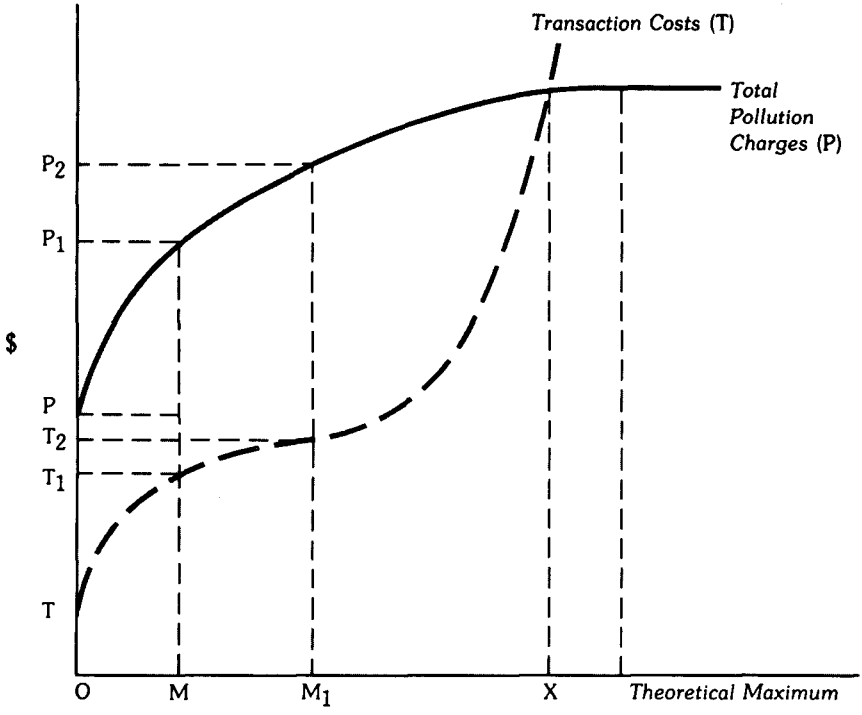


FIGURE 1

Control Costs and Charges

slight increase in monitoring levels (e.g. from O to M) causes a small increase in variable transaction costs (from OT to OT_1), but a large increase in pollution charges (from OP to OP_1). While the marginal cost of monitoring may rise very rapidly because of technological constraints, the fees derived may level off as accuracy in monitoring gives rise to the identification of fewer neglected or underestimated sources of fees.[14] There is a level of accuracy of monitoring (OM_1) which maximizes the difference between transaction costs and the pollution fees levied (OT_2-OP_2). This accuracy reflects a variety of variables ranging from completeness of coverage by the monitoring system to efficiency of the equipment used and expertise of the re-

14. The relationships shown in Figure 1 are continuous functions. It would not, however, be unusual for such cost and revenue curves to be stepwise in nature, reflecting the problems of indivisibilities in investments.

sponsible officials. Changes in any of these, especially technological innovation in monitoring equipment which reduces cost or allows increased coverage for the same expense, will cause a shift in the relationships shown in Figure 2. As indicated in Figure 1, any monitoring level between M_1 and X may be feasible, but inefficient, since increases in transaction costs are not paralleled by comparable increases in pollution fees. At X, the cost of monitoring equals the returns gained by levying pollution fees. The difficulty facing any management agency is not only to define M_1, but also to avoid the temptation to increase returns or pollution fees along the inefficient segment of the total pollution fee curve,[15] that is, beyond M_1.

Figure 1 assumes that variations between different situations, as well as between different pollutants, can be subsumed by the total cost curves. It also supposes given rates of pollution fees and ignores the benefit side of transaction costs.[16] Nevertheless, it does reflect real water quality management problems. For example, the monitoring of certain pollutants may prove to be prohibitively expensive and thus no charges are applied to them, or such charges are simply fees based on estimates. It also suggests certain logical strategies for the various parties involved. On one hand, polluters desire a reduction in the total pollution fees curve and thus may press for subsidies, grants and even reductions in pollution fee rates (P_a to P_b in Figure 2). The objective of the management system, on the other hand, may be to reduce transaction costs without reducing abatement objectives (T_a to T_b in Figure 2).[17] This situation is very important since it implies that voluntary agreement can be advantageous to both parties. The management agency, for example, may be willing to accept a decline in standards or in rates of pollution fees (as represented by P_a), provided that the polluters agree to certain binding objectives which reduce transaction costs to T_a. It would be reasonable for a management agency to insist that the difference between P_a and P_b (i.e. loss of pollution fees) at some level of accuracy M_1 (optimum in Figure 1) as shown by (OP_2-OP_1) and (M_1 A-M_1 B) in Figure 2 be no *greater* than the gain to the agency (OT_2-OT_1) and (M_1 C-M_1 D). If the polluting entity can self-monitor the agreement for less than (OP_2-OP_1),

15. This argument relies on the principle of diminishing returns to effort and requires that overall conditions remain constant.

16. In short, these benefits would include multiplier effects derived from such things as employment, equipment purchases, etc. The cost and revenues shown in Figures 1 & 2 do not include consideration of such spinoffs.

17. Buchanan & Tullock, *Polluters, Profits and Political Response: Direct Control Versus Taxes*, 65 AM. ECON. REV. 139 (1975). *See also* Comments, 65 AM. ECON. REV. 976-84 (1975).

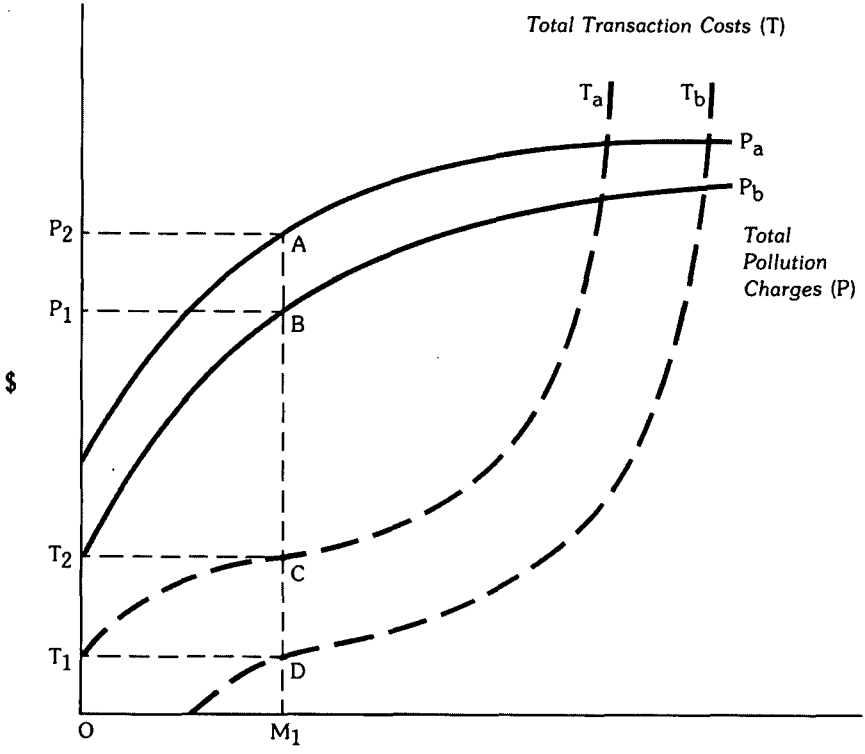


FIGURE 2

Shifts in Control Costs and Charges

then it is in their interest to be party to the voluntary agreement. It should be noted that such agreements do not reduce agency costs to zero since periodic checking of discharges would continue to be a normal practice.

In Figure 2 both (P) and (T) are reduced by agreement; the agreement constitutes a change in the underlying conditions of the pollution payment system. The change should be in the other direction, for example, if new controls created a shift in (P) and (T) to higher levels. Then the voluntary agreement might not reduce transaction costs and fee payments, but act as a way to hold the line on increases.

WATER QUALITY MANAGEMENT IN FRANCE

France, like other countries in Western Europe, does not rely on a single set of water management mechanisms. Rather, a whole series

of approaches, which may be complementary or conflicting, are employed simultaneously. One of the more unusual experiments is a system of pollution control agreements between the French government and various polluters. Before considering the *contrats de branche,* it will be useful to review briefly the characteristics of the French system of water quality management.

During the 20th century, the French have implemented major institutional changes and innovations in water management.[18] Although permits for water extraction and effluent discharge had been required for some time, a new law in 1917 provided that such permits relate directly to the nuisance value of industrial activities.[19] All industries were classified using a complex and comprehensive identification system and placed in groupings according to geographic zones. Each zonal group required types of permits and was allowed to locate at different distances from populated areas.[20] The *inspectorate* attached to this program helped in regulating industries' impact on various environmental elements, including water.[21] Competent authorities from other Services of the Administration also helped police the water quality (*police des eaux*).[22] Recently, major changes were made in the Law of 1917. The new system of "classified establishments" employs stricter criteria for classification, reduces the

18. For an up-to-date discussion see C. LEFROU & J. L. NICOLAZO-CRACH, LES AGENCES FINANCIÈRES DE BASSIN (1977); Harrison & Sewell, *Water Management in France: A Decade of Management,* 6 WATER 44 (1976).

19. *La loi du 19 décembre 1917 relative aux établissements dangereux, incommodes ou insalubres,* JOURNAL OFFICIEL, 21 DÉCEMBRE 1971. This law has been abrogated and replaced by: "La loi no. 76-663 du 19 juillet 1976 relative aux installations classées pour la protection de l'environnement." The law of 1917 is discussed in M. DESPAX, LA POLLUTION DES EAUX ET SES PROBLÈMES JURIDIQUES (1968). It is important to note that the "contrats de branche" discussed in this article are performed under the auspices of the laws of 1917 and 1976. The law of 1976 is discussed in Gousset, *La loi du 19 juillet 1976 sur les installations classées,* REVUE DE LA SÉCURITÉ (1978).

20. The three original classes under the law of 1917 were:

1st class: those activities required to be well away from human habitation; this class required permission from the prefect of the department as well as a municipal inquiry;

2nd class: activities which would "preferably" be at a distance from human occupance; second class activities required only a prefectoral permit;

3rd class: less noxious activities which were only required to announce their intention to locate to the prefect.

The major classification of activities, including the distance required from human occupance, were to be found in the DÉCRET, 20 MAI, 1953.

21. Until recently the number of inspectors was limited to 250. They were also required to find undeclared establishments and to administer summonses under the legislation.

22. Include the Ministères de: Agriculture; Equipement; Intèrieur; Industries commerce et artisanat; Culture et environnement; Santé publique; and Amènagement du territoire (DATAR).

number of geographic zones to two, extends the type of industry categories, redefines the meaning of establishment and increases the importance of the *inspectorate.*[23] This legislation suffers from the difficulties faced by any permit system. In addition, classified establishments also have to obtain discharge permits required for *all* dischargers of a certain size, creating, in effect, a double permit system.

Although point sources of pollution have been given considerable attention for some time, concern over the ambient quality of water resources in the 1930s gave rise to intense pressure for institutional reform.[24] Enabling legislation passed in 1964[25] established autonomous river basin agencies (*Agences financières de bassin*), mandated under national supervision,[26] to develop water plans for their respective areas[27] and implement a system of water charges (Figure 3). The legislation is designed to develop an integrated approach to water management which complements the *ad hoc* system of permits and legal prohibitions which existed under the 1917 law. One innovative feature of the *Agences financières de bassin* is their self-financing capability based upon the charges. The difference between total charges and operating costs of the agency is returned directly to water management projects without passing through the national treasury. The agencies do not themselves construct or operate water projects, they only give grants to other groups who act as a *maître d'ouvrage.* The most significant feature of the *Agences financières de bassin,* for purposes of this discussion, is their complex system of charges. There are two types of charges, one for water extraction and the other for waste discharge. The latter, of interest here, is applied differentially to industrial and domestic water users, but is not yet levied on the agricultural sector.

Charges for industrial pollution are levied on four types of pollu-

23. Under the Law of 1917 an establishment was defined as an industrial premise. The more recent definition includes many non-industrial activities, such as quarrying and educational establishments. Classes I and II now form one single class and the number of inspectors is now around 400.

24. Y. CHERET, L'EAU (1967). DESPAX, *supra* note 19, at 7-25.

25. *Loi no. 64-1245 du 16 décembre 1974 relative au régime et repartition des eaux et à la lutte contre la pollution,* JOURNAL OFFICIEL, 18 DÉCEMBRE 1964. *See also* JOURNAL OFFICIEL, 15 JANVIER et 6 FÉVRIER 1965. Numerous pieces of interpretive legislation have occurred since 1964. *See* CODE PERMANENT: ENVIRONNEMENT ET NUISANCES 627-818.

26. Although each Agence is governed by a "water parliament" made up of representatives from different user groups, overall objectives are of national origin and are adapted to local circumstances. *See* JOHNSON & GARDNER M. BROWN, JR., CLEANING UP EUROPE'S WATERS (1976).

27. These plans were published under the form of "livres blancs" (white papers) by La documentation française.

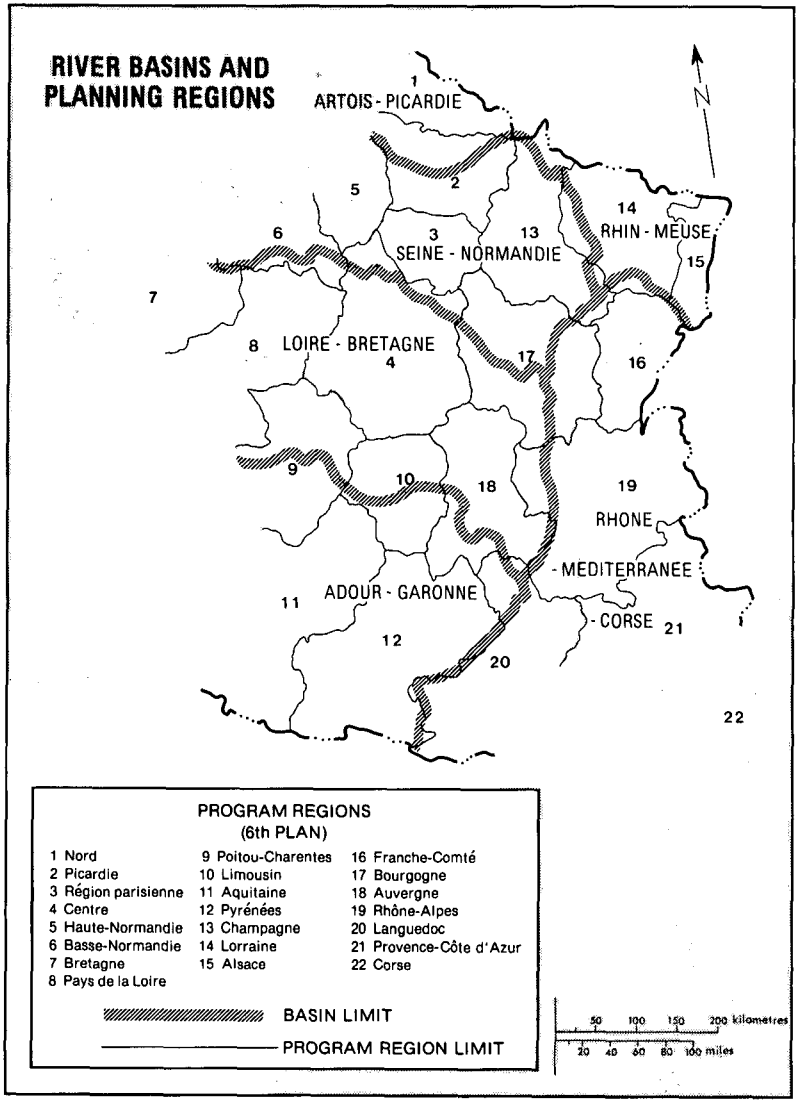


FIGURE 3

River Basins and Planning Regions in France

tants: suspended matter,[28] oxidizable matter,[29] dissolved salts,[30] and toxic matter.[31] A charge is defined at different time intervals and is based on units of each type of pollution (Table 1); these basic charges are applied basin-wide.[32] Various modifications are made to the charges using a series of coefficients. One set of coefficients differentiates geographically between high and low priority areas (Tables 2, 3). A second set acts as an incentive to invest in water pollution control at the plant level, thereby reducing charges according to type and efficiency of controls used.[33] The coefficients are in the form of a premium used in calculating the net amount of pollution on which charges are levied.[34]

Figure 4 outlines a typical procedure for applying pollution charges. It is significant that each plant may opt for direct measurement of its pollution output; if it does so, the costs of monitoring are added to the bill. Should the *Agence* require the monitoring, it bears the cost. Most often industry opts for an assessment by forfeit. Each industrial activity is given a "characteristic pollution unit" according to the production process and output on a typical day in the month of maximum discharge. This unit is equated with a certain level and type of pollution which is then used as the basis of charges. For example, pig farms are described in units of pigs produced weighing more than 50 kg. A pig is defined as generating 100 grams of sus-

28. The rules for the measurement of pollutants are very strict and are explained in *Circulaire du 14 janvier 1977,* JOURNAL OFFICIEL, 9 MARS 1977; *Décret no. 75-996 du 28 octobre 1975,* JOURNAL OFFICIEL, 30 OCTOBRE 1975; *Arrêté du 28 octobre 1975,* JOURNAL OFFICIEL, 7 NOVEMBRE 1975. Suspended matter is measured after soluble salts are removed.

29. Oxidizable (biodegradable) matter includes nutrient-rich materials such as human sewage, but also includes major industrial effluents, especially from such activities as pulp, paper and food products sectors. Oxydizable matter is defined as:

$$\frac{DCO+2(DBO_5)}{3}$$

where DCO is the chemical oxygen demand, and DBO_5 is five-day biochemical oxygen demand.

30. Dissolved salts are not a major problem in all river basins and are more typical of the Rhin-Meuse area. They are measured on the basis of water volume and conductivity.

31. Concerning toxic wastes, a great debate has taken place over their definition, measurement and legal status. Since the putting of such materials into water courses has always been illegal, especially under "codes" as well as by tradition and decision, it was felt that fees levied on such materials would constitute an acknowledgement of their existence. Toxic wastes are thus referred to as "matières inhibitrices" and the semantic problem seems to be resolved. Toxic wastes are measured on the basis of the inhibition of Daphnia-magna-Struas.

32. *Avis,* JOURNAL OFFICIEL, 30 DÉCEMBRE 1977 and 29 DÉCEMBRE 1978.

33. *See Délibération no. 76/24 du 13 octobre 1976,* Agence financière de bassin Adour-Garonne.

34. The detailed coefficients are too complex to be repeated here. They may be found in Arrêté du octobre 1975, JOURNAL OFFICIEL, 7 NOVEMBRE 1975 at Annexe II.

TABLE 1

Pollution Fees: Industrial Polluters By Agency

Agence Financière	*Kg/day Suspended Matter*		*Kg/day Oxidisable Matter*		*Kg/day Toxic Matter*		*Suspended Salts*
	1978-79	*1979-80*	*1978-79*	*1979-80*	*1978-79*	*1979-80*	*1979-80*
ADOUR-GARONNE	36.2	40.0	41.8	52.0	670	740	–
ARTOIS-PICARDIE	25.5	32.00	51	64.0	0.77	0.96	–
LOIRE-BRETAGNE	47.39	62.72	47.39	62.72	880	1035	–
SEINE-NORMANDIE	45.33	52.30	90.65	104.7	954	1086	1,350
RHIN-MEUSE	37.50	45	75	90	1000	1200	100
RHONE-MEDITERRANEE-CORSE	30.82	36.40	92.46	109.2	644	760	–

All figures in French francs

SOURCE: See footnote 32.

TABLE 2

Geographic Zones in the Adour-Garonne River Basin—
Coefficients Applied to Pollution Fees

Zone	*Coefficients 1978-1979*	
	Suspended and Oxidizable Matter	*Toxic Materials*
LAND ZONE I	1	1
MARINE ZONE I	1.25	1.25
MARINE ZONE II	0.70	1.25

SOURCE: See footnote 33.

TABLE 3

Pollution Payment Coefficients: Urban Centres

Class	*Population*	*Coefficient*
I	500	0.5
II	501-2,000	0.75
III	2,001-10,000	1.0
IV	10,001-50,000	1.1
V	50,000 +	1.2
VI	PARIS*	1.4
VII	Communes with no piped water	0

*departements: Paris, Hauts-de-Seine, Seine-Saint-Denis, Val-de-Marne

SOURCE: See foonote 36.

pended matter and 100 grams of degradable matter per day.[35] A pig farm with 75 pigs in the month of maximum pollution produces the equivalent of 7.5 kg/day of suspended matter and degradable matter. In the Adour-Garonne basin pollutants are levied at a total annual rate (1978-79) of 36.20 FF and 41.80 FF, respectively, for each kg/day equivalent. The producer would thus pay (7.5 x 36.20 FF) and (7.5 x 41.80 FF), a total of 585.00 FF in 1978. Using 1979-80 schedules, this would come to 700.00 FF. If this were in a priority zone (Zone 1, Table 2), the amount would be increased to 731.25 FF (875.00 FF in 1979-80). If the pig farmer had a complete biologic treatment facility, however, the different levies would be reduced by 90 percent and 80 percent, respectively.

Domestic pollution activity is dealt with somewhat differently

35. *Id.* at ANNEXE I.

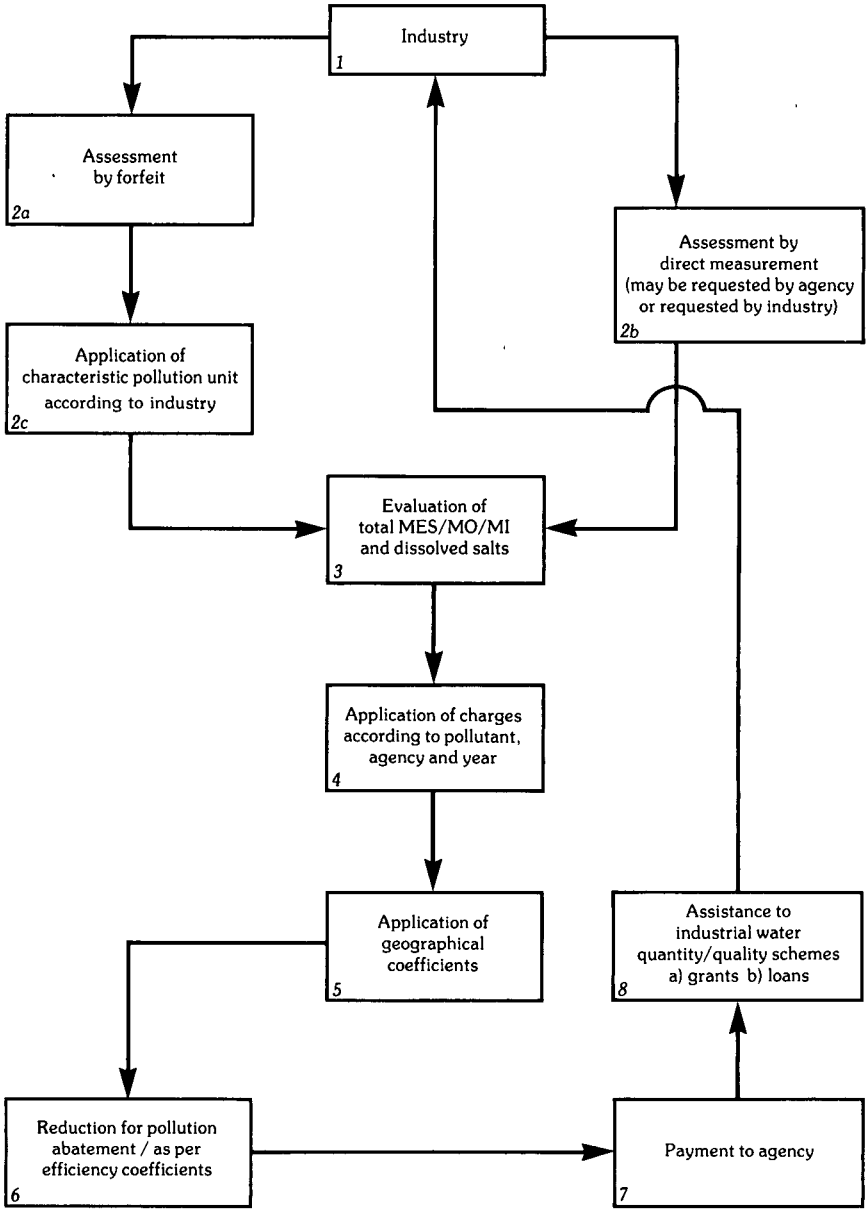


FIGURE 4

Procedure for Defining a "Redevance de Pollution" For A Specific Location (Industry)

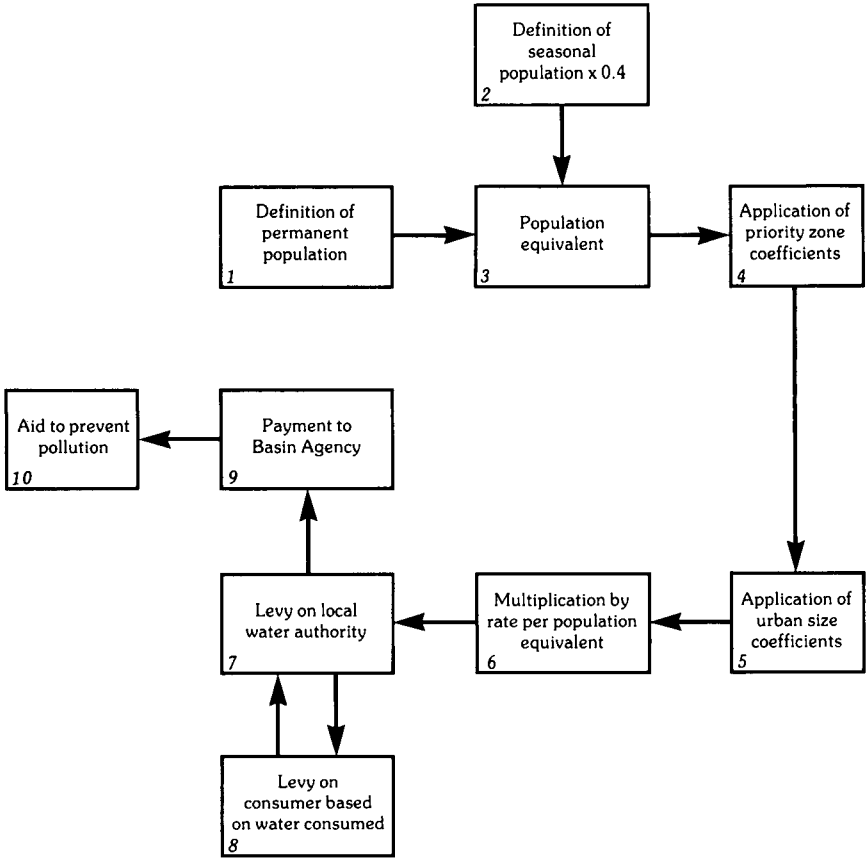


FIGURE 5

Procedure for Defining A "Redevance de Pollution" For A Specific Location (Municipal Water Users)

(Figure 5). The French government defines a pollution equivalent per person and the *Agences* attach a particular value to it.[3 6] In Adour-Garonne in 1978, for example, each person-equivalent was charged 7.05 FF/yr in priority areas and 5.64 FF elsewhere. For each community with a population of over 400, this amount is multiplied by (1) total permanent population, and (2) 40 percent of seasonal population if this is greater than 20 percent of (1) and greater than 400. A coefficient is applied according to the size of the urban area (Table 3)

36. *Id.* at article 17.

to arrive at the total amount due. Municipal governments levy the charge on water supply authorities, who in turn pass it on to households in proportion to the amount of water consumed.[37] For example, an individual living in a town of 150,000 population-equivalent in a priority area of Adour-Garonne will pay his water supply authority a fraction of (150,000 x 1.2 x 7.05) or 1,269,000.00 FF based on the proportion of all water consumption in the area where he lives.

It was intended that the charges for both water withdrawal and effluent discharge would be revised progressively upwards in the years following their introduction. This, in fact, has been accomplished. A number of events, however, have accelerated the pace of adjustment. Reappraisal became necessary as a result of severe droughts that affected most of Western Europe in the mid-1970s. In France the problem was especially severe in 1976 and emergency measures such as the imposition of a temporary income tax supplement and water consumption restriction were imposed. This gave rise to come concern that, despite all the reforms, water quantity problems had not been solved. Furthermore, a second ambient pollution monitoring scheme (required by law) was not introduced until 1976. Detailed results are not widely available, but there is some concern that except in certain specific cases, quality has hardly been improved.[38] The net result thus seems to be a bolstering of more traditional institutions–especially the *Prefect* and the Department. In recent policy statements concerning the application of articles of the 1964 Water Law and the definition of quality objectives for river stretches, the *Agences financières de bassin* are hardly mentioned, and all authority is vested in *Prefectoral arrêtés,* or orders to desist. Great importance is placed on public input to define objectives–but not via the "Water Parliaments" of the river basins.[39] This is not surprising in some ways because the *Agences* are not regulatory bodies. However, any change in regulations has a direct impact on them since they are a major source of technical expertise and financing. Understandably, therefore, there has been apprehension on the part of *Agences* at the recent shift in policy.

37. This constitutes a major departure from the "polluter pays" principle in that payment is now on the basis of *water consumed* and not *pollution generated.* The case is interesting in that it responds to the only major source of complaint about the levy system: the country's mayors. They objected to pollution levies on municipalities. They argued, rightly, that the municipalities are not the polluters–individuals are, and so they should be charged accordingly. The resulting structure may please the mayors–but it hardly approaches an equitable solution. *See Chronique juridique,* 7 ADOUR-GARONNE: REVUE DES EAUX DANS LE MIDI ATLANTIQUE 15 (1974).

38. *See Inventaire de la qualité des eaux,* 15 ADOUR-GARONNE: REVUE DES EAUX DANS LE MIDI ATLANTIQUE 13 (1978).

39. *Circulaire,* CUB/DPPN, 17 MARS, 1978, SECTION I.

Quite clearly, major changes are still taking place in French water management. Nevertheless, much of the policy and institutional developments of the 1960s and early 1970s still exists. The reforms, however, have increased transaction costs (Figure 2). The application of new pollution charges (e.g. for toxic wastes) and the alteration of charging systems (especially for domestic polluters) have also shifted the transaction cost curve. Closer analysis and more efficient billing and follow-up services also have increased pollution payments. In addition, the pollution charges curve has been shifted upwards because of increases in the rate of payment per unit of polluting matter as well as the inclusion of more substances in the charging formula. These increased costs, along with the other problems outlined above, have encouraged wider utilization of voluntary agreements.

VOLUNTARY AGREEMENTS

Since 1972 the French government has developed a series of voluntary contract agreements aimed at reducing specific problems of water quality.[40] It is widely recognized that the greater proportion of total pollution is caused by a few industrial sectors (Table 4). To date, most important agreements have been with particular industrial sectors (*contrats de branche*); recently, a contractual agreement was reached with a specific company.[41] Certain *Agences financières de*

TABLE 4

1972 Pollution Levels and 1977 Goals: Major Polluters

Sector	*Proportion of Total Pollution 1972**	*Goal 1977**
PULP PRODUCTION	20%	5 %
SUGARBEET	16%	4 %
DISTILLERIES	15%	2 %
WOOL WASHING	2%	1 %
YEAST PRODUCTION	1%	0.25%
POTATO POWDERING	2%	1 %
TOTAL	56%	13 %

*Percentage of total pollution: 1972 figures.

SOURCE: See foonote 39.

40. These "contrats de branche" are discussed in 3 ADOUR-GARONNE: REVUE DES EAUX DANS LE MIDI ATLANTIQUE 27 (1973), 4 ADOUR-GARONNE: REVUE DES EAUX 8 (1974), 8 ADOUR-GARONNE: REVUE DES EAUX 26 (1975), 9 ADOUR-GARONNE: REVUE DES EAUX 6 (1975); 4 L'EAU EN LOIRE-BRETAGNE 23 (1974).

41. Signed by the Minister of the Environment and la Société Pechiney-Ugine-Kuhlmann, 23 juillet 1975.

bassin have organized "river contracts," which are voluntary agreements with all the water users along a specific stretch of river.[42]

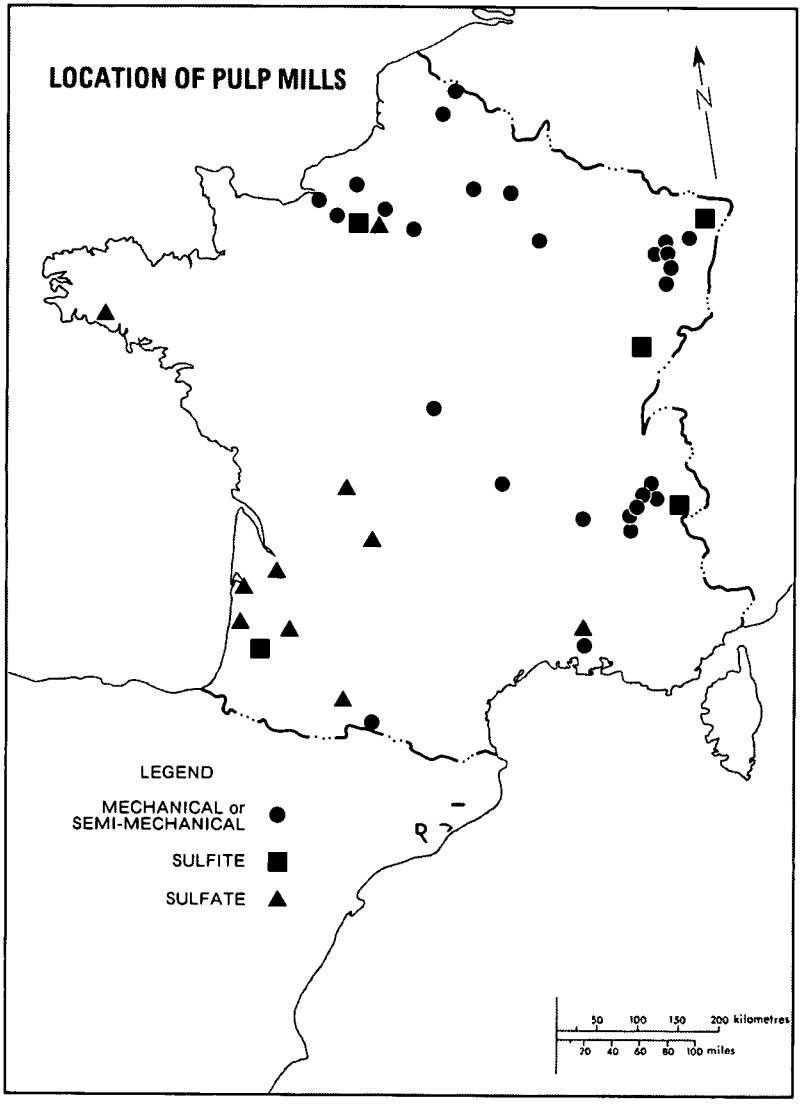
This discussion will concentrate on the *contrats de branche.* These contracts are negotiated and signed by a particular industrial sector and the central government. Once an agreement has been reached, members of the industrial sector reach effluent discharge objectives by a certain date. This is similar to some of the permit procedures used in North America. The government favors such contracts because there is strong evidence that a few industrial sectors produce most water pollution (Table 4). If pollution is reduced drastically and quickly, at low cost to the central government, less pressing management problems can be dealt with sooner. To implement the contracts the *Agences financières de bassin* claim that the administration has accepted a reduction in water quality standards. The industrial concern have an incentive to respect the contract, since they are normally relieved of some pollution payments to river basin agencies and become eligible for pollution control equipment grants and loans.

Since 1972 seven contracts have been signed: (1) Pulp and paper, 1972, (2) Sugarbeet producers, 1973, (3) Yeast producers, 1975, (4) Potato powdering plants, 1975, (5) Distilleries (from sugarbeet, molasses and wine based alcohol), 1975, (6) Rendering plants, 1977, and (7) Wool washing and carding, 1977. Each of these sectors shows a distinct and concentrated pattern of location, thus the contracts are of more importance to some regions of France than to others. The Adour-Garonne river basin area, for example, includes the main centers of activities 1, 2, 5, 6, and 7 above. These spatial differences are complemented by differences in the contracts themselves. The direct impact of the contracts on water quality vary greatly.

The pulp and paper contract is an interesting case in point.[43] Forty-one mills are currently operating in France. The industry is concentrated in the Seine Valley, the Vosges region of Alsace, the Rhône Valley, and the Landes (Figure 6). Most kraft (sulfate) mills are in the southwest. The mills in the other regions are largely chemical, semi-chemical and sulfite varieties. Although this industry produces over 20 percent of all industrial pollutants in France, the proportion is 40 percent in the Adour-Garonne river basin. Furthermore, certain types of pollutant are produced in greater quantities by this

42. 14 ADOUR-GARONNE: REVUE DE L'EAU DANS LE MIDI ATLANTIQUE 37 (1977). The idea of the contract is to include all water users (especially industrial sectors) along a particular river (in this case le Touyré). As such the contract is a geographical response to management problems.

43. *Contrat de branche entre l'État et l' industrie papètiere,* 12 juillet 1972, Ministère de l'environnement.



SOURCE Fédération des Syndicats de Producteurs de Pâtes

FIGURE 6

France: Location of Pulp Mills

industry than by others. Over 75 percent of the suspended solids discharged by all manufacturing are fibers from the pulping process, and over 90 percent of all industrial output of BOD_5 comes from pulp and paper milling.[44] Toxic sulphur compounds and mercury compounds are also produced in significant quantities.

The pulp and paper contract requires a sequence of effluent control measures, beginning with reduction of suspended matter. The initial daily pulp production objectives, expressed in kilos per metric ton (tonne) of pulp are shown in columm A of Table 5. In all instances, these objectives should have been reached by 1974.[45] The second, later set of objectives mandates a reduction of BOD_5 as shown in column B. However, stricter BOD_5 standards are accompanied by a massive reduction in standards for suspended matter. Normally this is permitted only when settling ponds control effluent discharge. Critics argue this is unnecessary and represents an acceptance of lower standards. A certain amount of fine-tuning is attempted by making a distinction between small plants (output less than 150 tonnes per day) and larger plants (output more than 150 tonnes per day). In general, the agreement is stricter with large plants. Distinctions are also made between geographic groupings of plants according to deadlines for compliance.

Between 1972 and 1979, over 400 million francs ($75 million) were to be allocated to clean up pollution from the pulp and paper industry; this represents 40 percent of total industry investment. The *Agences financières de bassin* supplied 10 percent, various ministerial sources 10 percent, an industry foundation (ENCELPA) 20 percent, and the industry itself, 20 percent. All signatories of the contract received aid to help in paying the pollution charges levied by the *Agences financières de bassin.* While new production facilities must meet the control standards within a year of completion, no assistance in paying pollution fees is available. The contract arrangement thus relies heavily on traditional forms of intervention, including financial assistance from public sources.

The contract with pulp and paper producers emphasizes cleaning up pollution. Effective use of classical effluent discharge procedures such as settling ponds, bio-chemical reduction systems, and mechanical separation, yields the required results and little attention is

44. Bouchard, *Les programmes contractuels contre la pollution industrielle,* 3 ADOUR-GARONNE: REVUE DES EAUX DANS LE MIDI ATLANTIQUE 27 (1973). *See also* ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, POLLUTION BY THE PULP AND PAPER INDUSTRY (1973).

45. Bouchard, *Les programmes contractuels contre la pollution industrielle,* 3 ADOUR-GARONNE: REVUE DES EAUX DANS LE MIDI ATLANTIQUE 27, 28 (1978).

TABLE 5

Pulp Industry Sectoral Contract: Allowable Levels of Discharge

		A	*B* *1975/76 Objective*	
		*Suspended Matter**	*Suspended Matter**	*DBO*
KRAFT	unbleached	2.5	10	5
	bleached	10	20	9
SULPHITE	with elimination of spent liquor	12.5	50	45
	without elimination of spent liquor	15	85	80
SEMI-CHEMICAL	capacity > 150 tonnes/day	5	5	8
	capacity < 150 tonnes/day	13	60	60

All figures in kilos/tonne of daily production
*At a 90% level of dryness.

SOURCE: See footnote 42.

given to changes in the pulping process itself. Older, less efficient mills are at a relative disadvantage by this arrangement. For these firms, the ultimate objective is not to clean up the process, but rather to divert polluting activity elsewhere. In at least one major instance, this has involved the replacing of coastal effluent discharge by a pipeline to deeper water.

In this system the cost to the industry is rather small. Seventy-five million dollars for over 41 mills during a five-year period at 20 percent represents an average cost of $70,000 per year per mill. In 1975, French pulp production totaled two million tonnes and the average amount spent per unit of pulp by the industry under the contract arrangement was about $1.50 per tonne.

Such an agreement can benefit both parties although it is not completely clear who has the most to gain. On one hand, the central government can achieve pollution control objectives quickly with positive political consequences. On the other hand, the direct financial involvement by the Administration (the 10 percent mentioned above) is the *only* case where the Administration pays directly for pollution abatement. All other financial assistance for water pollution abatement comes directly from the *Agences* and charges they levy. The low

level of involvement by the central government is nevertheless an extraordinary cost to them. Voluntary agreements from their point of view are quite expensive.

Industrial signatories to the agreements vary in their response to the terms. Newer modern plants are given a grant to clean up pollution instead of a fine for violating pollution standards. Smaller and less efficient plants could suffer great hardship from such an agreement because the costs involved might be excessive for them.

In summary, the French have made a concerted effort to improve efficiency in water management through area-wide organizations and charges for water withdrawal and effluent disposal. Lack of data makes it impossible to judge how successful these innovations have been in solving the problems of water scarcity and pollution. In some parts of France, river conditions have improved; in others, there has been little or no change, particularly in areas where pollution is severe. One reason for this is that effluent discharge fees are too low; polluters prefer to pay the fee rather than clean up. Many exceptions are made; high levels of pollution are tolerated in certain activities, particularly where an export market exists or technological change to reduce pollution would be very costly and difficult to accomplish. The system of *contrats de branche* is an attractive means of dealing with this difficulty. During the next few years, it will be interesting to see how effective they are in improving the water quality of France's major rivers.