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**ENFORCEMENT OF HAZARDOUS WASTE LEGISLATION
IN THE UNITED KINGDOM**

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PREFACE

This paper has been produced as part of IIASA's hazardous waste management work, which is the main component of the Institutional Settings and Environmental Policies project. The overall aim of this work, reflected in this paper, is to systemize our understanding of interactions between institutional and technical factors in policy making and implementation. The influence of institutional processes upon technical knowledge built into policy has been increasingly recognized. However, it has yet to be adequately systemized in comparative research on different regulatory systems. Institutional structures cannot be easily transplanted from one culture to another. Nevertheless, through the normal flux of policy, institutional development slowly occurs anyway, in more or less *ad hoc* fashion. Comparative insight may help to direct reflection and adaptation in more deliberate and constructive ways.

This paper forms one chapter of an intended book on hazardous waste management. The reader will therefore notice references to other draft chapters in this study which are also being published separately, and which are available from IIASA.

I would like to thank those policy makers and others who generously gave of their time and experiences in many interviews which form a substantial input to this work. A full list of acknowledgements will eventually be published.

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Eryl V. Ley and Brian Wynne

1. INTRODUCTION

The paper by Linnerooth and Davis [1] in this volume examined cases in which the responsibility for waste management policy is vested in central state authorities which also manage treatment and disposal. Implications for risk management and effective implementation were analysed. In this paper a sharply contrasting case is examined, the United Kingdom (UK), in which policy is highly decentralized, and treatment and disposal is virtually totally (98%) in the hands of private industry. Apart from landfill however, the industry is in economic difficulty and underdeveloped, so that the question arises whether the institutional structure would be able to effect a more stringent policy were it less fortunate in its endowment of relatively good landfill conditions.

The relatively relaxed posture of the UK government towards intervention in hazardous waste management was indicated in an earlier paper in this volume by Wynne [2]. This is also indicated by official UK national policy on hazardous waste disposal, which is:

"the summation of the advice given by the Department of the Environment plus the waste disposal plans made by the disposal authorities." [3]

The UK system of control for hazardous waste is one of the most decentralized, especially when compared to the US or FRG. Under existing legislation responsibility for enforcement and control is virtually all in the hands of local authorities - the *waste disposal authorities (wdas)*. The system of control has been built up over the last 120 years through piecemeal measures introduced to deal with hazards as they arose and/or with the increase of scientific awareness about various environmental problems [4]. To quote a Department of the Environment (DoE) official:

"Because the effects of pollution are usually experienced first within the confines of particular localities, one of the principles followed by successive Governments has been that the primary responsibility for dealing with pollution problems should rest, as far as is practicable, with authorities operating at a local or regional level, principally local authorities and the water authorities. Thus, central Government lays down the statutory framework for pollution control, but implementation is delegated to a large extent to local level. Authorities may in many areas exercise a considerable degree of discretion as to the limitation they impose on the release of local pollutants, so that account may be taken of local resources and social priorities, the uses to which surrounding areas are put, and the capacity of the environment to absorb pollutants, although in practice they often work to fairly uniform standards or widely accepted limits." [5]

Such institutional arrangements would be unheard of in the USA for example. In fact these "loose" arrangements are so "strong" in the UK

that they are the mainstay of its apparently successful* control system. However, Lord Gregson in his opening speech in the House of Lords Debate on the Report of the Select Committee on Science and Technology: Hazardous Waste Disposal (hereafter called the Gregson Committee and the Gregson Report) [6] made the following observation:

"There is a belief that because in this country there have been comparatively few major incidents, we can, without too much effort, maintain this position in the future. ... This complacency is, at times, tinged with the arrogance that "We know best", and has probably given rise to a very serious loss of public confidence in the whole activity of waste disposal." [7]

The Gregson Committee was set up in response to the concern expressed by a local authority, Basildon district council, about the landfill site in its area [8]. The inquiry began its investigations in 1980 and produced an extensive three volume Report in July 1981, making 34 recommendations to the government [9]. The Report is generally regarded as *the* reference work for hazardous waste disposal in the UK. Many of the recommendations have been implemented, and the Earl of Avon, in his response on behalf of the government in the debate about the inquiry in the House of Lords said that:

"Of the 34 recommendations the Government are able to agree unreservedly with 19 of them, in part with 8, 4 will be the subject of further consideration and consultation, which leaves 3 which they disagree with today, but that that disagreement is qualified." [10]

As mentioned above, the original reason for the inquiry was concern about a landfill site. This touches on the other major feature that distinguishes the UK from other nations - its adherence to land disposal

* A discussion as to what precisely constitutes successful control will not, however, be embarked upon here.

(referred to as landfill in this paper) and more particularly codisposal (disposal of hazardous waste together with domestic refuse in a landfill site) a method of disposal extremely controversial elsewhere. Recommendation 8 of the Gregson Report stated that:

"The safety of landfill, including codisposal depends vitally on good management. The scope for abuse is considerable and the waste disposal industry has sometimes been skating on thin ice. ... Accordingly landfill must not be used in marginal cases just because it is cheap - the 'cheapest tolerable means' approach - and all hazardous waste disposal must be subject to rigorous control." [11]

Despite public concern about the use of landfill as the major disposal method, the UK government's standpoint is that "sensible landfill is realistic and an ultra cautious approach to landfill of hazardous and other types of waste is unjustified." [12]

However this view is not shared by other countries:

The German Federal Environmental Agency states that:

"The FRG tends towards separate treatment even though this method is clearly more expensive than the former (codisposal). The motive ... is undoubtedly the principle of prevention." [13]

John Lehman then Director of the Solid Waste Program, of the USEPA says that:

"Our philosophy, as the land protection group within EPA, is to minimise hazardous waste disposal to land. Consequently we strongly support hazardous waste recycling or detoxification treatment prior to land disposal wherever possible." [14]

In Canada it was reported that:

"... for several years we allowed the disposal of industrial liquid waste up to 5% by weight, as well as 8% sludge, and found that we had problems of odour and leachate seepage through the sides of the landfill which finally resulted in our abandoning the practice". [15]

Thus, the adherence to landfill, the decentralization of regulatory authority and the privatisation of treatment and disposal are the three features which combined, distinguish the management of hazardous waste in the UK from many other countries. The problems of local enforcement of legislation in light of these features will be the main focus of this paper. Section 2 briefly describes past events and hazardous waste legislation up to the present time and this is then reviewed in section 3. The use of landfill as the "best practicable means" of disposal is the focus of section 4 and finally, section 5 discusses some of the many enforcement problems facing the *wdas* within the existing system.

2. HAZARDOUS WASTE LEGISLATION IN THE UK

2.1. HISTORICAL BACKGROUND

The first statutory control over the disposal of wastes in the UK was the Sanitary Act of 1388 that prohibited the throwing of:

"Dung, filth, garbage, etc. into ditches, rivers or other waters or places within, about or nigh to any cities, boroughs or towns."

As a result of a Royal Commission set up in 1842 to explore the health of towns, the first Public Health Act was passed in 1848 which set up the General Board of Health. Various other Acts were passed culminating in the Public Health Act of 1875. Several Amendments were made to this Act until a new Public Health Act was passed in 1936 which, in part, is still in force today. Under both these Acts, local authorities had various responsibilities in connection with waste collection and disposal. A local authority collected household waste free of charge, and if it collected

trade waste, was obliged to charge a reasonable fee - industrial waste collection was not included in the duties of local authorities.

The other important step in the legislation is related to land-use planning, which has grown into comprehensive and detailed control of industrial and other activities. The Town and Country Planning Act of 1947 provided local authorities with powers to control local land-use but the powers were insufficient to have an effect on disposal site management. Local planning authorities did not have sufficient technical expertise to devise or enforce adequate site controls [16].

These were the only controls existing in the UK up until the 1970s. However, attention was devoted to the general problem of waste disposal as early as 1963, with the setting up of a Technical Committee on the Disposal of Solid Toxic Wastes [17]. The efforts of the Committee received apathetic treatment from government and public for several years, until events overtook the authorities and enforced hurried official action to acknowledge the problem by legislation. The following account of events leading up to the first specific legislation on hazardous waste disposal is given by Lord Ashby*:

The Key Committee was set up in 1964 [18] as a result of an incident in 1963 when some animals died because of a fluoroacetamide leak from rusty drums which had been dumped by a local pesticide factory. The committee worked in a leisurely not to say glacial manner and it did not report for six years, not until 1970, and only had 20 meetings in the whole of the six years suggesting that little governmental pressure was being exerted. However, the findings of the committee were disquieting and it listed 17 serious incidents where toxic wastes had been dumped and caused damage. The Committee

*Lord Ashby is a leading environmental policy actor in the UK, he was Chairman of the 1971 Royal Commission on Environmental Pollution and an active member of The House of Lords Select Committee on Hazardous Waste Disposal, 1980/1.

made 38 recommendations but received little attention from the Press and none at all from the Government; despite the fact that this was the beginning of the period when public opinion was being aroused about the environment.

At the same time the Standing Royal Commission on Environmental Pollution was set up [chaired by Lord Ashby] and produced its report one year later in 1971 [19] expressing concern that nothing had been done to implement the recommendations of the Key Report. The Government's response was that they were preparing to reorganise local government.

The Royal Commission repeatedly approached the Secretary of State on the need for legislation to curb the indiscriminate dumping of toxic wastes and to have some type of control similar to that for air and water. The response was that more information was needed by the Department of Environment (DoE). The Royal Commission provided the information giving seven cases of dangerous handling of toxic waste - and this by a nationally known firm of waste contractors. There was still no response from the government.

In 1971 the Royal Commission drafted another report strongly criticising the Government for lack of action - the Government's reply this time was that there was no parliamentary time for more legislation. But in January 1972, the Birmingham Sunday Mercury revealed that employees of the same nationally known firm of waste contractors were dumping wet waste and drums containing cyanide, phenols, caustic soda and other materials - some of the drums were accompanied by a delivery ticket describing them as innocuous. This was disclosed by the Conservation Society. On February 22, 1972 a member of the Conservation Society visited parliament to try and get some action on the part of the Government. However, two days later on 24 February, there were headlines about drums of cyanide with labels being scratched off being found on waste land in Nuneaton where children played. One week after this was disclosed, a Bill was hurriedly pushed through Parliament - i.e., the 1972 Deposit of Poisonous Waste Act". [20]

In an explanation of the relevance of the above story, Lord Ashby goes on to relate a comment that appeared in an editorial in *The Times* under the headline "*How to move a Government*":

"It is instructive to note what did and did not prompt the Government to squeeze a Bill ... into an already crowded legislative programme. The urgent representations of an official commission ... moved by the "disturbing cases which have come to our knowledge", did not."

"Headlines about drums of cyanide waste on derelict land in the Midlands did." [21]

This was the first definitive legislation, i.e., the Deposit of Poisonous Waste Act (DOPWA) [22], for the control of hazardous waste disposal in the UK. The main provisions of the Act were:

a) a prohibition on the tipping of poisonous, noxious or polluting waste where it was liable to give rise to an environmental hazard. An environmental hazard was defined as subjecting persons or animals to material risk of death, injury or impairment of health or threatening the pollution or contamination of any water supply.

b) a notification provision was introduced whereby local and river authorities had to be notified before the removal or deposition of wastes. All wastes had to be prenotified at least three clear working days before removal or deposit. All wastes had to be notified unless they were specifically exempted from the Regulations, i.e., there was an exclusive list system, which failed safe in the case of ignorance. The Regulations provided a Schedule of descriptions of wastes, and if a particular waste was included on the Schedule and did not contain any hazardous quantity or hazardous concentration of a poisonous, noxious or polluting substance, then it was exempted from the notification procedure (see Appendix 1 for Schedule).

This Act was not meant to be more than an emergency measure; in 1974 the Control of Pollution Act (COPA) [23] was passed which remains the central piece of hazardous waste management legislation in the UK.

2.2. CONTROL OF POLLUTION ACT (1974)

Not all sections of the Act have been implemented, but those sections specifically relating to this paper and their date of implementation are briefly summarised below:

Section 1 (not yet fully implemented) - requires *waste disposal authorities (wdas)* to ensure that adequate arrangements exist in their areas for the disposal of controlled wastes.

Section 2 (implemented 1978) - requires *wdas* to investigate what arrangements are needed for the purpose of disposing of controlled waste which is situated in their areas and of controlled waste that is likely to be so situated. In addition, they have to prepare and periodically revise a waste disposal plan.

Sections 3-11 (implemented 1976) - define the site licensing system. Site licensing is the most fundamental regulatory instrument of controlled waste disposal in the UK. All sites which receive controlled wastes must be licensed by the *wdas*. Site licences which specify operating conditions for the disposal sites, are issued by the *wdas* after consultation with the Health and Safety Executive (HSE) (to ensure safe working conditions for employees and residents nearby), the Regional Water Authority (which has the power of veto over the licence if it is thought that there is any risk of polluting the water supply), and in England, where the *wdas* is a County Council, the local district council also for planning permission.

Section 17 (implemented 1976) - provided for the introduction of Regulations applying tighter controls to the more difficult wastes and

their disposal, i.e., "special wastes". The Control of Pollution (Special Waste) Regulations 1980, were drawn up in 1980 but did not come into force until March 16th, 1981. At the same time the 1972 Deposit of Poisonous Waste Act was repealed.

The Control of Pollution (Special Waste) Regulations 1980

The purpose of these Regulations was to fulfill the UK obligations under the 1978 European Economic Community (EEC) Directive on Toxic and Dangerous Wastes [24] and to provide for tighter controls over the *transportation* of dangerous wastes. The purpose of the Regulations is to:

1. Preserve the prenotification system for the disposal of wastes prescribed in an *inclusive* list (i.e., there was a switch from the exclusive list under DOPWA) as laid down in Part I of Regulation 2 (see Figure 1).

Acids and alkalis
Antimony and antimony compounds
Arsenic compounds
Asbestos (all chemical forms)
Barium compounds
Beryllium and beryllium compounds
Biocides and phytopharmaceutical substances
Boron compounds
Cadmium and cadmium compounds
Copper compounds
Heterocyclic organic compounds containing oxygen, nitrogen or sulphur
Hexavalent chromium compounds
Hydrocarbons and their oxygen, nitrogen and sulphur compounds
Inorganic cyanides
Inorganic halogen-containing compounds
Inorganic sulphur-containing compounds
Laboratory chemicals
Lead compounds
Mercury compounds
Nickel and nickel compounds
Organic halogen compounds, excluding inert polymeric materials
Peroxides, chlorates, perchlorates and azides
Pharmaceutical and veterinary compounds
Phosphorus and its compounds
Selenium and selenium compounds
Silver compounds
Tarry materials from refining and tar residues from distilling
Tellurium and tellurium compounds
Thallium and thallium compounds
Vanadium compounds
Zinc compounds

FIGURE 1. UK Inclusive List under Control of Pollution Act 1974

2. Institute a consignment note system for the disposal of these wastes, giving a cradle-to-grave for each disposal; special provisions were also made for season ticket arrangements (see section 3)

3. Require the keeping of records at landfill disposal sites showing the location of special wastes deposited there.

4. Give power to the Secretary of State enabling him to direct a consignment of special waste to a specific site (this power is only used in an emergency).

The term "special" is related to potential hazards which are likely during transport and is defined in Regulation 2, Part II (see Figure 2).

MEANING OF "DANGEROUS TO LIFE"

1. Waste is to be regarded as dangerous to life for the purposes of these regulations if—

- (a) a single dose of not more than five cubic centimetres would be likely to cause death or serious damage to tissue if ingested by a child of 20 kilograms' body weight or
- (b) exposure to it for fifteen minutes or less would be likely to cause serious damage to human tissue by inhalation, skin contact or eye contact.

Assessing effect of ingestion

2.—(1) The likely effect of ingestion is to be assessed by the use of reliable toxicity data in the following order of preference:—

- Class 1: information about the effect of oral ingestion by children;
- Class 2: data derived by extrapolation from information about the effects of oral ingestion by adults;
- Class 3: other information about human toxicity;
- Class 4: information about animal toxicity;
- Class 5: information about the toxicity of analogous chemicals.

(2) Where conclusive information falling within one of the classes set out in sub-paragraph (1) is available no regard shall be paid to information falling within a class bearing a higher number, and the reference to using data in an order of preference is to be understood accordingly.

3. Where the waste is in such a form that—

- (a) the ingestion of less than five cubic centimetres is not possible, or
- (b) there is no risk that a toxic constituent could be assimilated if the waste were to be ingested,

then it is not to be regarded as dangerous to life by reason of sub-paragraph 1(a) of this schedule.

Mixed waste: samples

4. Waste is to be regarded as dangerous to life if a sample of five cubic centimetres taken from any part of a consignment falls within either of the descriptions in paragraph 1 of this schedule.

FIGURE 2. Definition of 'special' waste under Section 17 Regulations

The remaining sections of the Act are not directly relevant to the present discussion (e.g., they relate to noise pollution, atmospheric pollution, etc.) and are not discussed in this paper.

In summary, the two main provisions of COPA are the licensing aspect and tighter controls on the transportation phase. An analysis of the pros and cons of this system and all the enforcement problems that arise for *wdas* are discussed in the following sections.

The other two surrounding pieces of legislation related to hazardous waste are the *Dumping at Sea Act (1974)* [25] and the *Health and Safety at Work etc. Act (1974)* [26].

Table 1 summarises the main developments in UK hazardous waste legislation up to the present time.

2.3. ADMINISTRATIVE CONTROL

Waste Disposal Authorities

Responsibility for waste disposal rests with 165 *waste disposal authorities (wdas)* which in England are the County Councils and the Greater London Council (GLC), in Wales and Scotland the district councils, and elsewhere the island councils. Municipal waste disposal has always been in the hands of local authorities and the fact that almost total responsibility for hazardous waste is in their hands is an extension of this role. Under COPA *wdas* have virtually complete responsibility for site licensing - the "backbone" of hazardous waste regulation - and for monitoring yet the expertise to complement these new responsibilities is lacking. According to one *wda* official, "most *wdas* were staffed in

TABLE 1 Summary of Legislative Development in the Field of Hazardous Waste Disposal in the UK.

1970	Technical Committee on Disposal of Solid Toxic Wastes (Key Committee)
1971/1972	Royal Commission on Environmental Pollution. 1st and 2nd Report
1972	Deposit of Poisonous Waste Act
1973	DoE Consultation Document. Waste Disposal: Proposals for a New Framework
1974	Protection of Environment Bill. Control of Pollution Act Health and Safety at Work, etc. etc.
1975	EEC Directive on Waste
1976	Licensing of Waste Disposal Regulation
1980	Special Waste Regulations House of Lords Select Committee on Science and Technology: Hazardous Waste Inquiry
1981	Special Wastes Joint Review Committee. House of Lords' Report
1982-1983	Joint-Review of Special Waste Regulations
1983	Hazardous Waste Inspectorate Set up within Department of Environment.

1974/5 with a *theoretical* structure which it was *hoped* would meet the needs of the expected introduction of disposal site licensing and the new hazardous waste regulations" (my italics) [27]. In each of the authorities there is a waste disposal executive which may be an autonomous department under its own chief officer, or a section of another large department, or sometimes just one individual who has several other responsibilities. Many of the executives are short of scientific staff and field workers to monitor sites are in shortest supply.

Central Government

Responsibility for hazardous waste lies with the Land Wastes Division of the Department of Environment in England, the Scottish Department in Scotland and the Welsh Office in Wales. In a letter to Basildon District Council in 1979, Mr. R. Osmond, Director 'B' of the Land Wastes Division of the DoE had the following to say about official central policy on hazardous waste:

"It may therefore reasonably be said that the national policy for the disposal of all controlled waste - including hazardous waste - is a summation of the policies of the individual waste disposal authorities developed within the legal framework and on the basis of technical and administrative advice provided by the Department." [28]

What this actually means is that the main burden of information and control is on the *wdas* and the limited task of central government is threefold: legislative, appellate and advisory. Its functions are (a) to provide a general oversight of waste disposal legislation, (b) to adjudicate on appeals against refusal of site license applications and on planning appeals involving waste disposal sites, (c) to provide administrative and technical advice to disposal authorities - this is largely carried out via a series of 23 Waste Management Papers (WMP) [29] by informal consultation and by commissioning research. According to one DoE official the WMP series are held in high regard not only in the UK but also abroad. One of the reasons put forward for this success is the excellent rapport industry and public authorities have with the DoE. The rapport with industry is based on a long standing relationship evolved over many years. It is in fact argued that it began with the bringing in of the Alkali Acts of 1863. [30] In addition Harwell operate a Waste Management Infor-

mation Bureau which is mostly funded by the Department of Environment. It should be emphasized that the role of the governmental departments is purely *advisory* and not mandatory.

One of the recommendations of the Gregson Committee was the setting up of a Hazardous Waste Inspectorate which is now in existence within the Department of the Environment. (see section 5)

Water Authorities

According to the Gregson Report [31] the regional water authorities and the Scottish River Purification Boards have the duty of controlling water pollution. Water pollution is the most serious potential risk from landfill and accordingly *wdas* have a statutory duty to consult the water authorities before granting a site licence which the water authority has the right to veto, subject to appeal by the Secretary of State.

Relations between water authorities and *wdas* are said to be good and getting better, apart from a feeling that water authorities are too protective. Historically, the protection of water supply has been very strong, much more so than in other areas of environmental protection, and the water authorities are reluctant to countenance any risk at all unless they are forced to do so [32]. Over the years the water authorities have built up a high level of technical expertise which *wdas* could not hope to meet. Views differ on the role of water authorities, e.g., Harwell experts foresaw trouble ahead over balancing water protection and waste disposal interests and felt that formal arbitration would be needed [33], but the National Water Council are content with the present administrative system which can be made to work without major changes in their opinion

[34].

Waste Disposal Contractors

The private sector account for 98% of all waste disposal, half of this being conducted "in-house" (i.e., within the confines of the industry itself - e.g., B.P. Refinery Llandarcy in South Wales have their own landfill site and dispose of almost all their own waste - such sites still require a licence from the local *wda*). The rest of the waste is in the hands of several large and many small companies whose trade association is the National Association of Waste Disposal Contractors (NAWDC). NAWDC accounts for about 75% of the overall activity of the industrial sector. Members subscribe to a Code of Practice aimed at raising the standards of the industry. The NAWDC also have their own classification of waste into: *white wastes* (least hazardous with characteristics similar to those of domestic refuse leachate); *black wastes* (extremely hazardous and generally not acceptable for landfill); and *grey wastes* (by definition those wastes which do not fall into the other two categories) [35].

The Code of Practice also lays down recommended practices for ensuring accurate identification of waste and its properties, reliable documentation, safe loading, etc. According to the Gregson Report therefore [36]: "The framework for hazardous waste disposal is thus a joint venture between the private and public sectors, with considerable cooperation between the two, in which the private sector provides the service and the public sector provides the control." Needless to say, this may be regarded as an idealized model.

3. ANALYSIS OF LEGISLATION

The major differences between the 1972 Deposit of Poisonous Waste Act and the 1974 Control of Pollution Act are shown in Table 2:

TABLE 2 Major Differences between DOPWA 1972 and COPA 1974

<i>DOP WA 1972</i>	<i>COPA 1974</i>
No site licensing	Site Licensing (implemented 1976)
Prenotification of disposal	Consignment note system (implemented 1981)
Exclusive list Qualitative definitions	Inclusive list Quantitative definitions (implemented 1981)
Local Authority and Regional Water Authority joint responsibility	Local Authority sole responsibility

3.1. SITE LICENSING

The sections dealing with site licensing under COPA were brought into force on 14 June, 1976. Since site licensing is regarded as the most important part of hazardous waste regulation, it merits detailed discussion. Waste Management Paper No.4 - The Licensing of Waste Disposal Sites [37] lays down the Government's general policy towards licensing. The aims of site licensing according to WMP4 are as follows:

(1) to ensure that waste treatment and disposal are carried out with no unacceptable risk to the environment and to public health, safety and amenity.

(2) to put at a suitable local level the responsibility for deciding what conditions should be imposed at a given site, so that local circumstances can be taken fully account of.

(3) to ensure that changing patterns of waste disposal do not prejudice objective (1) above, and equally that those responsible for waste treatment and disposal take proper advantage of technical progress.

(4) to give waste disposers a clear idea of what operating standards are required of them.

(5) as a result of (4) above, to secure the provision of sufficient facilities for the treatment and disposal of waste.

(6) to ensure that sufficient information is available to the responsible authorities to enable them to fulfil their statutory duties.

Central government's role is purely advisory as laid down in WMP4, there is no other central scrutiny other than when appeals are made to the Secretary of State.

The operation of the licensing system by the *wda's* is constrained by various provisions made under COPA. Under COPA the *wdas* must consult with the following before granting a disposal site licence:

- the relevant collection authority;
- the relevant water authority;
- the Health and Safety Executive;
- the Institute of Geological Sciences for deep mine or well disposal.

Planning permission has to be obtained first. Planning is concerned with suitability of the area for the proposed development, the main con-

siderations being local infrastructure, visual aspects, etc. Once a site has planning permission a *wda* can only refuse a licence on the grounds of (a) water pollution, or (b) danger to public health. The drafting of conditions for licences is to some extent governed by the licence application, i.e., type of waste, amount, choice of disposal method, under the initiative of the proposer not the *wda*. An example of licence leeway for loose practices and control over volumes is given by Willetts:

"Application forms for a site licence include such questions as "estimated maximum daily quantity" to be delivered for each waste - if the answer is 800 tonnes, does this mean 800 tonnes per day, every day, 800 tonnes once a month, once a year or is that figure indicated to allow for plenty of leeway? Data on quantities and their mix tend to be vague which means that if the *wda* is not 100% sure what waste a site is taking, how can it take the necessary precautions, e.g., for protective clothing, fencing etc." [38]

Therefore the granting of licences, and all the associated provisions and restrictions must be based on sound scientific/practical reasons. There are several problems here, one of the most important being that there is still insufficient knowledge on the long-term behaviour of hazardous wastes in landfill sites under different conditions. A major consideration is degree of risk where many factors have to be considered and often the *wdas* do not have the necessary staff or expertise and will have to look to the water authority or Health and Safety Executive for advice. The *wda* has a statutory duty to consult the water authority regarding pollution of surface water, aquifers, and by law the *wda* has to heed the advice of the water authority. However, despite all, the final decision lies solely with the *wda* and it may be necessary for it to employ independent experts, e.g., hydrologists to help make a decision [39]. The problems of lack of resources/expertise is discussed further in section 5.

With the introduction of site licensing, industries with their own waste disposal facilities have had to decide whether to invest money to meet licensing standards or to close them down. In many cases the conditions of site licence severely restrict the uses to which the site can be put in terms of waste disposal. The site licensing procedure for disposal of hazardous wastes has proved to be a controversial subject and appeals against what appear to be overly severe licence conditions, are often made. The way the system is set up leads to a basic contradiction because the generator is virtually free of blame as the actual licensing procedure takes the responsibility off the producers. Yet this flatly contradicts a key principle of regulation, namely producer responsibility wherever the waste eventually goes. This dilemma has not been solved.

3.2. PRENOTIFICATION AND CONSIGNMENT NOTE SYSTEMS

Figure 3 gives a schematic representation of the two systems taken from a paper by Willetts [40]. In his paper he argues that the "notification procedure established under DOPWA was not intended as a consignment note system but rather a pre-notification system of intent the purpose of which was to alert the regulatory authority about the movement and disposal of toxic wastes and to build a data bank for future use." Some of the more basic administrative problems of such a system were discussed by one senior environmental health officer [41]:

- o illegible signatures,
- o no telephone number,

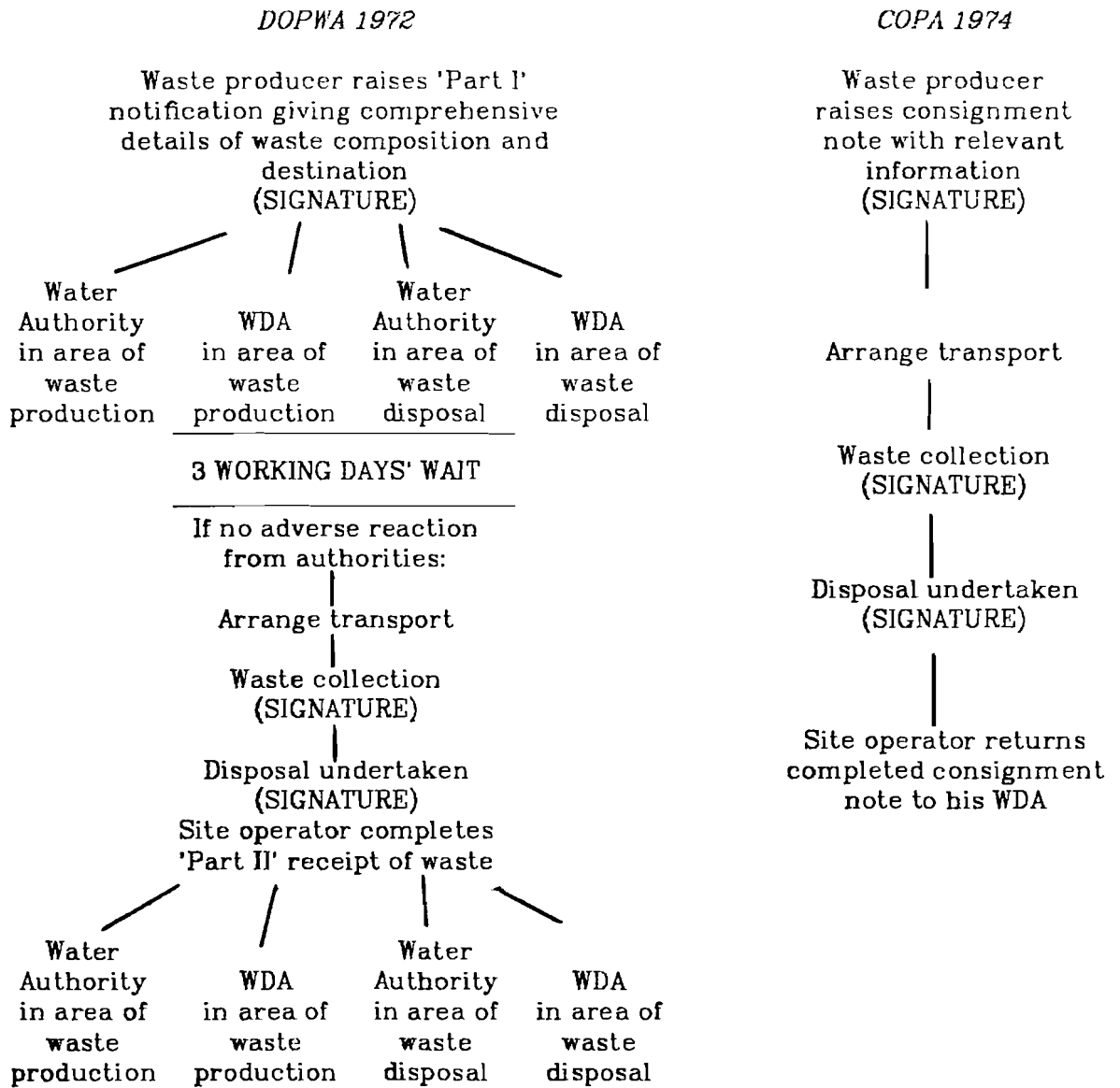


FIGURE 3. Schematic representation of notification procedure under DOPWA, 1972 and COPA, 1974

- o 3 clear working days is often not long enough (.e.g. the notification may have been forgotten, second class instead of first class postage may have been use, loads would arrive prior to notification),

- o vague terms regarding quantities (one skip load - is it full, half empty, empty? - 3 drums - what size drums? etc.),

- o "season ticket" arrangements, removing ability to track individual waste consignments,

- o etc. etc.

Although these problems are certainly not insurmountable, they add to the daily problems of the *wda* officer, to the point where it is impossible to supervise the system properly.

The new Regulations were introduced to comply with the EEC Council Directive which would in theory reduce the amount of paperwork facing industry, and *wdas*, by placing the burden upon local inspection and monitoring rather than a virtually unmanageable system of paperwork. Although similar systems are in operation in other countries, e.g., the FRG and seem to work with apparent success and satisfaction on the part of the authorities - other countries began with only an inclusive list, and have not had the experience equivalent to the 1972 prenotification system, so comparisons cannot be made. According to Willetts [42], "the DoE's standpoint is that with the introduction of site licensing the need for prenotification has been removed. The purpose of DOPWA was to inform regulatory authorities of what was happening to toxic wastes. Therefore there is no further purpose for prenotification as the conditions of operations specified in each site licence afford the proper con-

trol mechanism."

The consignment note system as developed under COPA is the better known cradle-to-grave system whereby each transaction from waste producer to waste disposer (final) is accompanied by a personal signature on the consignment note to ensure safe disposal. Penalties for non-compliance with the consignment and record-keeping systems are, on summary conviction a fine of up to 1000 pounds sterling and on conviction on indictment to imprisonment and an unlimited fine.

Some disadvantages and advantages of the consignment note system as compared to the 1972 prenotification system are for example: under COPA a standardized individually referenced form is used for each special waste, this was not the case under DOPWA; the disadvantage of this is that the *wdas* will need more administrative staff and producers will have to pay for the forms and necessary administrative work; another advantage of the new system is that a cradle-to-grave route is completed and signed for at each stage; the disadvantage is that the site clerk in charge of daily operations may not be competent enough to signify that the site licence authorizes a particular deposit. No site clerk should be expected to make decisions on the interpretation of legal documents - the standards of the *wdas* impose in their licences are disparate so that clerks in one area may merely be required to read, whereas in another area he may need a law degree [43].

3.3. DEFINITIONS AND WASTE LISTS

UK national legislation is strongly influenced by European Community Policy in hazardous waste and other fields. In 1976 the Commission submitted to the Council a draft proposal for the Council Directive on Toxic and Dangerous Wastes which was adopted at the end of 1977 [44]. The EEC Directive defined "toxic and dangerous waste" to mean any waste containing or contaminated by one or more of the 27 categories listed in the Annex to the Directive, in such quantities or concentrations as to present a risk to human health and the environment. However, the Directive did not specify any concentration limits. The UK list adopted to comply with the EEC Directive, thus changed from the exclusive list (see Appendix 1) to the inclusive list system (see Figure 1). Presently there are 31 categories on the UK list. Only those wastes which qualify to be on the list are termed "special" according to Section 17 Regulations and as mentioned previously, refer to the transportation stage only, relying on site licensing for the rest of control - thus, the catch-all provisions of DOPWA are no longer necessary. The percentage of wastes which were notifiable under the earlier legislation and will not be subject to the Special Waste Regulations is about 70%.

One of the arguments for the change was that under DOPWA, the exclusive list meant that many borderline cases were notified which did not increase control but did increase paperwork. In addition, it was claimed that industry resented having to notify so much. The inclusive list was meant to relieve the *wdas* of the unnecessary paperwork and to increase the time spent in the field. Whether or not it has been successful in this respect is still a matter of (heated) argument.

The major problem with regard to the inclusive list system is "what constitutes a special waste?" Under the Section 17 Regulations, a special waste is defined in Regulation 2 Part II, Part I being the list itself (see Figures 1 and 2). In many cases, of course, this definition is clear, e.g., concentrated sulphuric acid, however, it is almost impossible to give a complete listing of all classes of substances let alone individual substances that could be hazardous, e.g., magnesium under certain conditions can be very dangerous (in fires). Waste Management Paper 23 [45] provides guidelines from the government to help the various actors decide whether their waste is included on the list or not. Figure 6 is given in Annex 2 of WMP23 [46] which is the assessment procedure for deciding whether a waste is "special."

Points 1-4 in Figure 4 were made by one *wda* official regarding the problems he faces in assessing whether a waste is special:

(1) *Does the waste have a flashpoint of 21°C or less?* The use of a flashpoint criterion means that all wastes which are petroleum spirits or low flashpoint solvents are special wastes. Difficulties arise when these materials are mixed with varying amounts of other compounds which could raise the flashpoint above 21°C. For example, mixtures of acetone and water may or may not have a flashpoint of less than 21°C depending upon the relative concentration in the mixture. It would be quite possible for a producer to decide that normally the flashpoint is above 21°C and, therefore, the waste is not special. *It is then up to the Waste Disposal Authority to prove that the material is a special waste if it wishes to take enforcement action.*

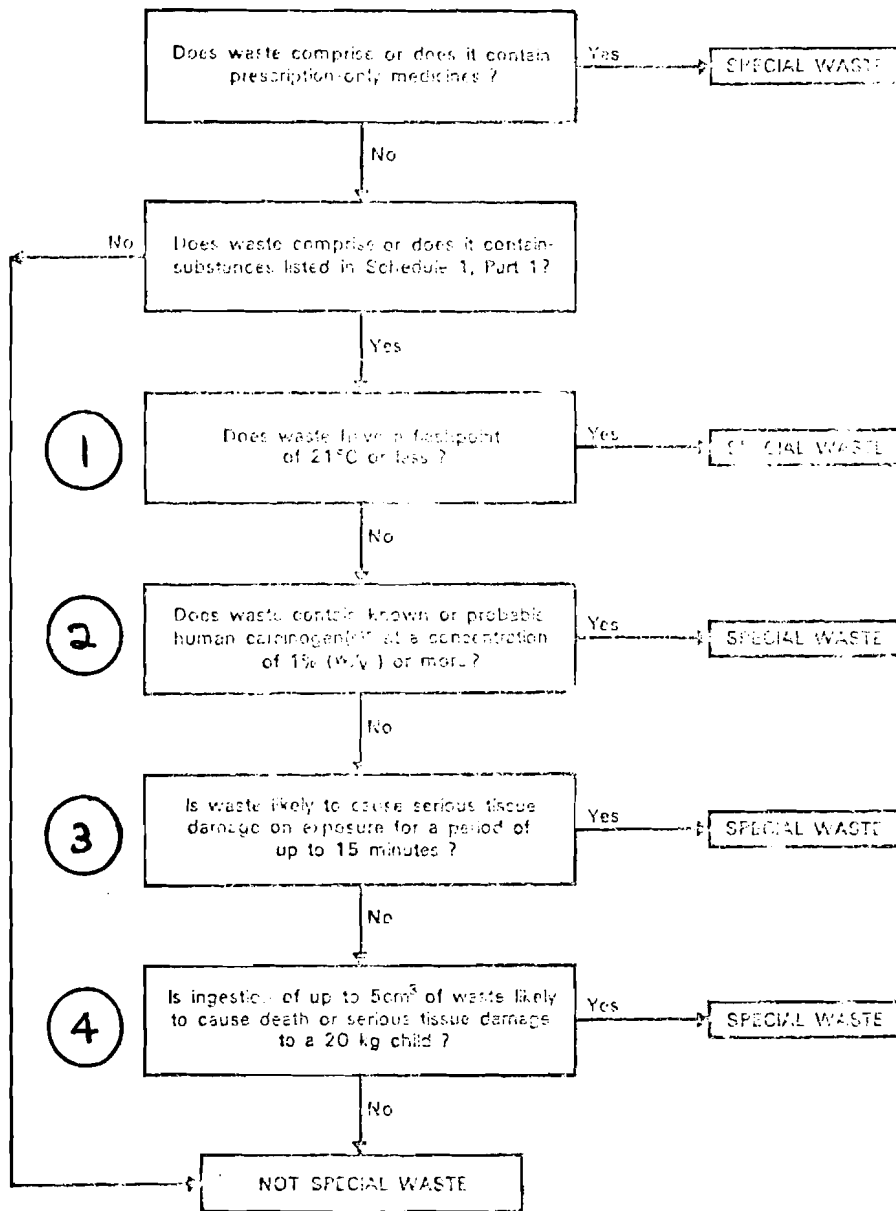


FIGURE 4. Assessment Procedure for 'special' waste

(2) *Does the waste contain known or probable human carcinogen(s) at a concentration of 1% or more?* Whilst it is fairly clear which materials are currently classed as carcinogens it is much more difficult to decide if the concentration at which the material is present is in excess of 1%. *Again the problem of proving the situation in borderline cases rests with the Waste Disposal Authority.*

(3) *Is the waste likely to cause serious tissue damage on exposure for a period of up to 15 minutes?* The only guidance that is available refers to injury of sufficient severity to threaten life or cause permanent physical impairment or disfigurement. This vague requirement is difficult to quantify in terms of attack on the eyes which are by far the most sensitive organs quoted. In some cases, e.g., water can cause more damage than a special waste. The imposition of the 15 minute exposure rule and individuals' differing reactions to chemicals are also very difficult to quantify, i.e. there is plenty of scope for discretion and disagreement.

(4) *Is ingestion of 5cm³ of waste likely to cause death or serious tissue damage to a 20kg child?* The use of the term child in this criterion leads to a more hysterical response than is required. The regulations were drafted with the idea that children were more likely to ingest a portion of waste than adults. The use of 5cm³ can be argued, but it is far more quantifiable than many other aspects. The main problem for producer and *wda* is obtaining toxicity data which is reliable enough to be credible. [47]

Indeed, much of the data necessary to determine acute toxicity of chemicals to small children is just not available. It is often necessary to fall back on animal toxicity data and even here information can be scanty. In the opinion of the Association of County Councils:

"... the theoretical foundation of the calculations remains highly unsatisfactory ... The reliability of human toxicity data is extremely poor ... Extrapolation from figures for a rat or rabbit to a 20kg child is impossible." [48]

The other point to consider is whether the toxicity definition serves the purpose for which it is meant or will it give lawyers a field-day. The Gregson Report suggests that the Regulations do not call for "a 'pass' or 'fail' toxicity test, but a toxic hazard assessment and any prosecution relating to a disputed waste will have to be judged on the basis of professional opinions about the likely effects of ingestion or exposure." [49] The Association of County Councils and the Metropolitan Authorities maintain "that waste disposal authorities will have the greatest difficulty in proving in court that certain wastes are special. Producers wrongly defining waste as not special should reimburse the waste disposal authority the cost of testing." [50]

Apart from the change in the list itself, the basis for inclusion on the list changed too. Under DOPWA, a waste could be notifiable according to the presence of a substance (i.e., qualitative aspect) rather than its concentration (i.e., quantitative aspect), under the Special Waste Regulations it could drop out of the controls if diluted sufficiently. This obviously encourages the mixing of hazardous wastes with inert wastes at production sites so that the waste is no longer regarded as special. Thus, if site licence conditions are vague and are not strongly enforced, there

is a danger of hazardous waste being deposited on unsuitable sites.

3.4. RESPONSIBLE AUTHORITIES

The *wdas* now have complete control and responsibility for any particular site. The water authorities will not be involved at all other than in the licensing phase. Willetts argues that "the logic in having a single body responsible for special wastes is tempting - dual responsibility is obviated, paperwork reduced, simplicity promoted. However the *wdas* do not have common attitudes and standards"[51]. This trait cannot usually be attributed to the water authorities where the level of expertise is generally of a high standard and they could easily outmanouver *wdas*. Thus perhaps the continuance of dual responsibility would be better than autonomy.

The *wda's* themselves object mainly to the Regulations because of cash limits and manpower restraints. Here are some quotes from the Gregson Report:

"The change from administrative control over environmentally significant wastes to field control ... will place a considerable extra workload on waste disposal authorities." [52]

"Those authorities with a small enforcement establishment and a curb on recruitment may well find the regulations an acute embarrassment." [53]

"There is call now for a complete change of approach to legislative control. I think the pre-notification system under the Deposit of Poisonous Waste Act was sufficient in many of their minds for them to act as a clerking administration, studying pieces of paper falling on the desk, filing, and that sort of thing. I honestly believe that, if the Control of Pollution Act and the section 17 systems are to be worked correctly and efficiently and effectively, the officers are going to have to get out in the field and police their operations more. I think there is a subtle change in requirement." [54]

Concern about the implications of the Regulations has been widespread and was the subject of a conference held in the UK in November, 1981 [55]. In addition, a Joint Review Committee was set up to review the regulations [56] and it is probable that at the time of writing the report may already be available.

4. SOME RELEVANT FEATURES OF UK HAZARDOUS WASTE MANAGEMENT

4.1 HOUSE OF LORDS SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

- HAZARDOUS WASTE DISPOSAL

"... The Inquiry came about because of the concern expressed by the people of Basildon, regarding one of the largest waste disposal sites in the country at Pitsea; and of course, it is a site where codisposal of hazardous waste and domestic waste takes place." [57]

The Inquiry, under the Chairmanship of Lord Gregson, was set up in 1980 to make an extensive investigation into the state of hazardous waste disposal in the UK.

As the quote indicates, the inquiry was set up in response to repeated requests by Basildon district council to the government to set up a public inquiry into the national policy for toxic waste disposal and local landfill disposal for toxic waste such as that at Pitsea which is situated on the Thames Estuary. The local residents felt that Pitsea was *the* landfill site in the UK and that they were taking more than their fair share of waste in the absence of national policy. Although Pitsea is within Basildon district council, it comes under the control of Essex County Council. The existence of Pitsea has long been of great concern to Basildon district council and according to one district councillor, Pitsea will

never be accepted by local residents, they have never been consulted at any time and the fact that Basildon is a growth area was never taken into consideration when it was decided to site Pitsea landfill in the area [58]. Complaints from Basildon about Pitsea go as far back as 1974, and in 1978 the Council appealed to the Secretary of State under the Planning Act but lost [59]. Under the present regulations the only measure of control a district authority has in England is under the Planning Act and there is strong resentment by Basildon district council that they do not have any other measures of control. There is a feeling that Essex County Council is too "removed" from the actual situation while the district council represents the local interests far better because of the invested political interest.

The Committee interviewed at length all the major actors in the waste disposal industry emphasising mainly on

- definition of hazardous waste
- methods of disposal and scientific knowledge thereof
- economics of disposal
- administrative responsibilities
- regulations
- recommendations

One of the main problems facing the Committee was how much hazardous waste is produced. According to Harwell "we do not know how much hazardous waste is produced in the UK, who produces it, what it is and what happens to it," [60] and Table 3 [61] gives what is probably an optimistic idea of the range of uncertainty involved. It is very significant that this range of uncertainty in the arisings was regarded as shocking and intolerable by the Gregson Committee who came to the problem fresh and innocent, whereas Harwell experts thought it was pretty good to enjoy a relatively narrow range.

TABLE 3 Estimates of amounts of 'notifiable' wastes produced in UK.

Gregson ¹	4.4m tons/year
DoE	3.7m tons/year
Harwell ²	4.0m tons/year
Institute of Solid Waste Management	5.0m tons/year

(1) This figure is based on returns from *wda's* where other considerations are important (e.g., *wda's* are not consistent in what they regard as 'notifiable'; in-house wastes not reported)

(2) This is an approximation as Harwell's figure varies from 2.5-5m tons/year.

Even allowing for a margin of error the DoE figure is especially low: the discrepancy seems to suggest that the demand for facilities is greater than recognised and that resources within *wdas* should be increased - especially if as is suggested, the chemical industry doubles its production over the next ten years [62].

One of the problems with the UK system is that local authorities are supposed to be responsible for providing adequate facilities for treatment and disposal of the wastes arising within their area but they have no control over these wastes in the sense that their producers are free to export them elsewhere and anyway the investment in facilities in the UK is a nearly totally private industry affair. There is no institutional mechanism for coordinating the capacity (and distribution) of waste treatment and disposal facilities with the volume and distribution of arisings. An example of the kind of dislocation this can lead to occurred when the treatment and disposal company RECHEM International decided to invest in a new incinerator plant close to Shell's production plant near Manchester which would be its sole customer (the large volume of waste was being transported to another incinerator plant further away). Whilst RECHEM was making this major financial commitment, but with what it thought was an established and assured market from a single large customer, Shell was privately deciding to change its production process altogether, for commercial and technical reasons which it was not prepared to advertise. By the time RECHEM was ready to use its new plant close by, its customer Shell turned off the input tap to the plant and RECHEM was left stranded with a major new plant and its only rationale, the "assured" business from the nearby Shell plant,

evaporated.

4.2 MAJOR DISPOSAL METHODS

There are four main methods of disposal:

- o landfill
- o incineration
- o treatment (chemical neutralization, ion-exchange, etc.)
- o disposal at sea

The ideal situation of course, would be not to have to consider such methods at all, but to develop new production processes which would eliminate wastes altogether. However, the UK system's ability to generate the institutional pressure towards waste-reducing technologies of production or recycling is highly problematic. According to one Chemical Industries Association (CIA) official, "most companies revamp over time, or in the case of smaller ones they would probably be doing it automatically without realising it. The chemical industry laughs at the EC directive on recycling [63] and the laws of chemistry say that they live in a dream world." [64] However, where industry is concerned market forces would certainly dictate before the laws of chemistry. In fact the CIA seems to be at odds with itself here since the memorandum submitted to the Gregson Committee says the following, "Industrialists seek to design processes and plant to maximise the yield of saleable products, and also where economically viable to re-use and regenerate materials, and substance. The justification for this is normally a saving on material and energy costs, and the production of more product for sale, rather

than a saving in the cost of waste disposal." [65]

A report by the consultants, Environmental Resources Ltd. [66] discusses the UK position on recycling in comparison with other EC countries. According to the findings of the report "there is a distinct danger that recovery rates will actually decline unless governments and the EEC act to boost demand for waste materials." [67] The report continues, "... there have been three EC Directives on waste [68] suggesting that emphasis be placed on recycling, but judging by their impact on practice in the UK they seem to have been totally ineffective. ... In several other countries, e.g., Denmark, FRG, France a strong commitment has developed and this is enshrined in legislation and encouraged by appropriate financial measures to increase the amount of waste recovered. ... Of all major EEC states, the UK has stood out in its diffidence in this area." The report concludes that policy on recycling in the UK is almost the reverse and according to Betts, "there is no substantial or continuing commitment to these goals of the kind that has emerged elsewhere in the Community, nor is there any real prospect of such a commitment developing in the near future." It is not surprising therefore that the proportion of waste landfilled in the UK is higher than in any other member state (see Table 4).

TABLE 4 Disposal routes for municipal solid waste in some EEC countries [69].

Method of disposal	Denmark	France	FRG	Netherlands	UK
Direct tipping					
Controlled landfill	37	54	69	50	91
Conventional Incineration	11	14			
Incineration with energy recovery	45	21	28	30	8

Landfill

Table 5 indicates the estimated amounts of waste disposed of by the various methods and the cost per million tonne.

TABLE 5 Estimate of amount/cost of waste disposed of by the major disposal methods.

Method of disposal	Amount ¹	Price charged for disposal ² (excludes transportation costs)
Landfill	2.7m tons	2.50 - 35 pounds sterling/per tonne
Incineration	400,000 tons	40 - 900 pounds sterling/per tonne
Treatment	400,000 tons	10 - 390 pounds sterling/per tonne
Sea disposal	400,000 tons	2 - 95 pounds sterling/per tonne

(1) Ref [70]

(2) Ref [71]

From Table 5 it can be seen at a glance why industry prefers landfill to other disposal methods. About 75% of all notifiable wastes are disposed of by landfill, of these 50% are landfilled in-house. In England there are 5,000 or so sites which are licensed to take controlled waste but only 500 are licensed to handle the special wastes that come under Section 17 Regulations. Of those 500, 200 are in-house, 200 are operated by contractors and 100 by *wdas*. According to the DoE, apart from being the cheapest method of disposal: "sensible landfill is realistic and an ultra-cautious approach to landfill of hazardous and other types of wastes is unjustified". [72] This conclusion is based on the results of a study carried out from 1973 to 1977 on 19 landfill sites in the UK which represented the main geological types found in the UK (in fact the UK is said to be lucky with its geology in this respect as there are many clay

areas). In general there are two broad methods of land disposal:

1. concentrate and contain
2. dilute and disperse or codisposal with 'ordinary' municipal waste

The first method involves permanent storage and is usually the more expensive of the two methods. This method involves containerisation of the waste (often after pre-treatment) and usually lining the pit with plastic or clay. Linings of plastic are expensive, there is no certainty what will happen, physically or chemically, over a long period of time to the plastic; it can rip easily, its effectiveness depends, in part, upon even pressure in the fill, which may be an unrealistic assumption under normal operations, and it is difficult to lay in the first place. This system has not been in operation for long enough and is not widely used enough to be confident that it works well. Clay liners are often natural, thick and 'tough', their effectiveness makes use of the adsorptive properties as well as the physical impermeability of clay.

Dilute and disperse or codisposal involves the mixing of liquid/solid hazardous waste together with domestic refuse - in this way attenuation of hazardous waste can be enhanced by adsorption, chemical reactions, biodegradation, etc. The DoE report concluded: "...it should be noted that extensive experiences in the UK over a long period of time has shown that very few documented cases of significant groundwater contamination due to landfills have occurred, thus indicating that the controlled disposal of wastes by landfill is acceptable." [73] A DoE official has observed:

"Landfill means all things to all nations. It may be to a carefully selected, well-engineered and properly managed facility, either for co-disposal with other wastes or solely for hazardous waste, or it may be to an uncontrolled dump. As improved control measures are implemented the uncontrolled dump is gradually disappearing in most European countries; *in England it has disappeared.* (my italics) There are also national differences in the concept of controlled landfill: the UK, based on its research findings, promotes a landfill philosophy which acknowledges and utilises the beneficial effects of - codisposal and the natural mechanisms of degradation, attenuation and dispersion. An entirely opposite view prevails in much of continental Europe, where controlled landfill disposal for hazardous waste means the concentration of such wastes in sites wherein they are contained, either naturally or by artificial liners, and where all leachate produced is collected and removed for treatment.

The international perception of the UK's attitude to hazardous waste management is interesting. Whilst acknowledging the degree of control achieved, the expertise applied and the relative lack of problems experienced by the UK, our European partners are nevertheless critical of what they see as the indiscriminate consignment of wastes to landfill, simply on the grounds of its relative cheapness. The facts are very different: the UK may fairly be said to have achieved high standards in respect of environmental protection and public health related to waste management long before most of the other European nations. Hazardous waste disposal has been specifically regulated since 1972, all disposal sites for controlled wastes have been subject to licensing since 1976 and codes of practice covering a wide range of hazardous waste have been published by the DoE, commencing in 1974. It is ironic in the criticism received to reflect that in the UK there is little evidence of the inheritance of problem sites reported by some of our European neighbours." [74]

Despite the UK's staunch support for landfill in other countries it is largely discouraged. The range of attitudes in the UK towards landfill gives a good illustration of how policy analysis and decision is conducted in this field. First, there seems to be only a very small relatively close-knit scientific community involved. Everyone knows everyone else on an almost personal basis. Second, although there are differences of view, these are usually understated in public, and in any case on basics such as landfill there does seem to be a well established consensus, even it it

is in the belief that the UK is in respect of landfill lucky, more than well-managed.

Harwell, for example, in their evidence to the Gregson Committee were not so convinced of the merits of landfill. They argued that: "... for *certain* hazardous wastes their limited codisposal in a controlled fashion would result in no serious pollution hazard over and above that presented by domestic and light industrial waste on the site." [75] They then go on to say "it is imperative for the DoE to produce guidelines on the extent to which the codisposal of given toxic wastes was considered to be an environmentally safe practice. For some materials codisposal is not considered advisable and alternative technological approaches are advocated. For others the data is still somewhat imprecise and research is still in progress to provide improved guideline data. ... Since the Landfill Research Programme was initiated in 1973 there has been a considerable change in the structure of the waste disposal industry and in waste disposal technology. The investigations carried out then showed how certain types of wastes such as heavy metal sludges and cyanides behaved in both landfill sites and lysimeter type experiments. Since then the guidelines on the best disposal practice for most, but not all, of the major groups of compounds have been produced." [76]

The main point of this examination of UK landfill policy has been to show how the policy system in the UK draws very different, more relaxed conclusions about landfill and codisposal than almost any other country, and how easily it is able to insulate its policy commitments from international criticism and divergence despite its isolation. However, whether the present UK institutional system *could* if it were ever deemed

necessary, generate the impetus to establish more sophisticated treatment and disposal infrastructure (and its effective use) is doubtful.

5. SOME PROBLEMS OF ENFORCEMENT

"... from the evidence it is obvious that for hazardous waste, many of these *wdas* are understaffed or at full stretch, with scientific staff and field workers to monitor disposals in shortest supply". [77]

5.1. VARIATIONS IN STANDARDS

Following the findings of the Gregson Report, the Waste Disposal Engineers Association conducted its own survey into the licence process and standards of enforcement on waste disposal sites. The survey only looked at *wdas* at the county level in England and although "site licence conditions are fairly standard throughout English *wdas* their enforcement and interpretation varies considerably." [78]

The results of the survey indicate that staff involved in the monitoring of sites is around 1 to 16 with the average being 4, the time spent being about 3000 hrs per annum. In addition, there is a large variety in the number and size of sites operating in the different counties and those handled publicly and privately. The amount of staff time for each site varies enormously and according to the report, the time varies from 13 to 130 hours per site per year. However, there appeared to be no link between man hours per site and the standard of the site; the standards may possibly depend more on the quality of the control work rather than the scale and competence of the site operator. About half of the waste disposal engineers feel they have a systematic inspection along the lines

of the Code of Practice, but over two-thirds are not satisfied with the standard and frequency of inspection.

Some counties do sample wastes, but most consider that they are barely scratching the surface and would like to be able to do more. However, there are many practical difficulties in obtaining representative samples, then there are problems with analysis itself, interpretation of results, etc. Opinion is divided between those who think *wda* site standards are better than private site standards and only one county considered their private site to be better. However, in the view of the NAWDC, public sites are a 'disgrace' and it deplores the fact that the public sector gets involved at all other than to monitor. The NAWDC feels this is an encroachment on its interests and feels that *wdas* involved in this side of waste management spend their time obtaining contracts instead of serving the community by regulating [79].

Wdas as far as possible seem to rely on advice/persuasion to deal with licence problems before prosecuting offenders. Although there has been a high measure of success this has usually been with operators who wish to act responsibly anyway but who made mistakes, so there is now a feeling that tougher measures have to be established for persistent offenders. The problem is that it takes 3 months to 2 years to get a case to court and then sentences are often too light. For example, most offences fall under magistrates courts, where the maximum fine allowable is only 1000 pounds sterling. However, should a case actually reach the court defendants usually have good scientific experts and can employ a good lawyer, while *wdas* have to rely on the local authority lawyer who represents the authority on a wide variety of cases.

The overall findings of the Waste Disposal Engineers Association's report were similar to that of the Gregson Report with the not surprising outcome that standards of enforcement are generally low and vary enormously between counties. At the district level in Wales and Scotland the discrepancies are often far worse and certainly resource problems are far more acute. For example, one environmental health officer *A*, in Wales, when asked what he would do if a member of the public asked him where an old car battery should be disposed of, answered that he did not know; another environmental health officer *B* in a nearby *wda*, has been conducting surveys on his own initiative into the amount of hazardous waste arising from local school laboratories, chemists, etc. and what they do with this waste. *A* could be thought of as ignorant and not doing his job correctly which in the true sense of the word is correct, however, the handling of waste (all waste) is only a small part of his overall responsibility. In another district - a receiver of hazardous waste - the staff in the Pollution Control section now consists of 2 people. Formerly there were 4 but with a shift of political emphasis to housing, the department was reduced to 2 and the housing department was boosted. This arbitrary designation of personnel is another indication of institutional blocks to professionalism in the field.

In most district *wdas* the officials responsible are expected, amongst other responsibilities (of equal importance), to (a) take charge of all consignment notes and follow up queries, (b) control licences and check that conditions are met, and (c) monitor sites, take sample checks, etc. This is in addition to managing all conventional waste facilities etc. Thus apart from the lack of expertise, often *wdas* cannot cope with the sheer

volume of work involved e.g., in one district with 2 staff members dealing with problems of waste, approximately 2,000-2,500 notifications are received per year, often with 5-6 page attachments.

Apart from manpower problems, as a Welsh Office consultation paper stated:

"Some district councils face difficult problems in providing even the basic facilities for waste disposal. Accepting that the main form of waste disposal in Wales is by landfill, waste disposal authorities need an adequate land bank of potential disposal sites to ensure that they can plan their waste disposal operations for at least 10 years ahead. At present 19 Welsh district councils have less than 5 years' tipping reserves. A further 10 have reserves between 5 and 10 years and only 8 in excess of 10 years. At technical officer level there seems to be a willingness to consider sharing disposal facilities with neighbouring authorities but cross-border solutions are politically unattractive."
[80]

One of the recommendations of the Gregson Committee was the setting up of a Hazardous Waste Inspectorate "to augment the control of waste disposal authorities".[81] This recommendation has in fact been put into practice. The main responsibilities of the Inspectorate which comes under the control of the DoE and not the HSE as recommended in the Gregson Report, is to ensure the uniform application of legislation and ensure that private and public facilities have uniform standards. The Inspectorate was not, however, created by statute, and therefore does not have any power of enforcement and will have to rely on persuasion to achieve improvements. The Inspectorate will report annually (the first report being due shortly) and initially will concentrate on sites which receive large amounts of hazardous waste. A large portion of the work was previously done on an *ad hoc* basis within the Land Wastes Division of the DoE but is now formalised within the Inspectorate. It is ironic that with the setting up of the Inspectorate the workload of the Land Wastes

Division has increased but the staff level has decreased. This is because the Inspectorate, which consists of 3 inspectors and 1 administrator (plus one inspector each for Wales, Scotland and N.Ireland), drew 2 of its staff from the Land Wastes Division, which is an indication of the very small pool of regulatory expertise in hazardous waste management. In fact, because of political pressures, there are no resources for replacements within the Land Wastes Division nor to increase the number of Inspectors to the envisaged 5. What this actually means, is that despite the apparently large step of creating a Hazardous Waste Inspectorate, the effect has been to increase the number of regulators by 1.

In a Management Information Systems for Ministers (MINIS) report published recently, it was shown that despite a slight increase in staff numbers from 1980 to 1983, the work programme of the Land Waste Division is still behind schedule. Some of the points mentioned in the report are summarised below [82]:

- work has yet to begin for example, on waste exchanges or training needs of the waste management industry;

- there is likely to be little progress in encouraging recycling - either via changes in production processes or via incentives to recycle such household wastes as batteries, tyres, glass, etc.;

- the review of the "Special Waste" Regulations is behind schedule as are several other legislative initiatives, e.g., new powers for *wdas* to control the storage of hazardous waste;

- due to staff shortages the advisory and appellate functions of the Division have been seriously affected (i.e., it is unable to deal with the

increasing number of appeals made and new or revised Waste Management Papers have still to be issued).

5.2 WHERE DO *WDAS* GO FOR HELP?

In the final analysis, despite so-called sophisticated legislation, and a thriving waste management industry, it is the local *wda* administrator who is responsible for enforcement. Where does he go when he is not sure, for example, if a load contains not just *x* but a mixture of *x* plus *y*? Where does he look for specific help in negotiating detailed licence conditions with an industry wanting to build a treatment and disposal plant? Where does he obtain money to do tests and where are the tests done? These are the sorts of questions which are central to UK waste management. Section 17 Regulations might on paper be a sophisticated control mechanism, but if they are not enforceable by the *wdas* they may be of no more than symbolic use. A Harwell official goes further and says that "the problem is that unenforceable laws are made and everyone behaves as if they are good and being enforced." [83] What is the answer then to the apparent success of the UK system, despite all the criticisms?

The following statement was made to me on two different occasions, once by a senior official at the DoE and secondly by an official at Harwell "If someone from the USEPA has discussions with an industrialist, there usually has to be at least one lawyer present. The fact that almost anyone, and especially industrialists can telephone the head of the Land Wastes Division of the DoE for advice on a certain problem is something incomprehensible in the American situation" [84]. Or in other words, there is institutional mistrust from top to bottom rather than trust as in

the UK.

In one district BP Refinery has its own in-house landfill site and until recently an incinerator (purpose built for acid tars). The local *wda* license the site and monitor it. They make an occasional visit to the site but as the local environmental officer emphasised the whole network is based on trust. In fact, if there is likely to be a problem, usually associated with smells, BP telephone the *wda* beforehand so that if a member of the public does complain the *wda* will already know the cause of the problem. If the *wda* needs any scientific advice or laboratory tests they automatically call up the head of the laboratory at BP who readily helps out. In another district a similar situation exists whereby the local expertise and help is provided by RECHEM International - a reputable waste disposal company. Again a high level of trust prevailed and there seemed no doubt in the mind of the *wda* official that he could trust the people at RECHEM. The whole culture is summed up in the official advice given by the DoE in their WMP 23 [85], that conflicts or ambiguities can be resolved by mutual consultation of relevant parties.

The foregoing examples are taken from district level *wdas* which according to the Gregson Report "in Wales and Scotland, the disposal responsibilities should follow the English model and be transferred from district councils to the county councils".[86] However most of the officers in charge in the smaller district *wdas* thought that, apart from the problem of small resources, they were far more in command of the situation in that they know "who is who" and what is what" in their area and they argue, this cannot work so well at the county level. In Wales for example, as a result of the above recommendation by the Gregson Committee, the following options were put forward [87]:

option 1 - transfer function to county council

option 2 - joint committees or boards

option 3 - Welsh waste disposal organisation

option 4 - a single joint public/private Welsh waste disposal company

At the time of writing, responsibility still lies with the district councils although there are now informal liaison groups, not only in Wales (e.g., Newport, Suffolk). These consult regularly on waste matters and are made up of *wdas*, industry, waste contractors and water authority officials who alternately chair the group. The system is thought to work well, according to the DoE [89] although no details are given.

In the GLC, the largest *wda* the situation on the face of it is quite different, yet in some basic elements remains the same. With a full-time staff of approximately 30 consisting of chemists and engineers they have a wealth of technical expertise and feel they do not need to go elsewhere for advice - in fact they go as far as to say, "what are central government doing anyway?"[90] and have little contact with their central government counterparts across the Thames. On the financial side they have similar problems to smaller *wdas*. The GLC have tried many times to prosecute would-be offenders but have had little success usually because the offender, even if only a small industrial operator, had the necessary finance to employ a good lawyer while the GLC has to rely on an in-house expert who is inexperienced in the specialist role of being a legal expert witness, and an in-house lawyer who is not a specialist in waste matters and is dealing with many other cases at the same time.

Wdas tend therefore to look locally for help and advice and not to central government or scientific laboratories. The informal network seems to be strong at two levels, (a) the *wdas* and other actors within their locality, and (b) the 'top' officials of central government, NAWDC, CIA, industry, Harwell etc. This gulf is apparent in the problems that local *wda* officials face in enforcing central government legislation. Emphasising this point one *wda* official said that concern about hazardous waste should emphasis upon (i) who is actually doing the enforcing, and (ii) the small industrialist, printer or local chemist who often does not even know that he is producing a hazardous waste which means he usually does not know what to do it, nor has he the funds to do it. He went on to say that the results of recent advertising about what to do with old medicines did encourage individuals to return them to local chemists but then the chemist was faced with the problem of disposing of them and simply could not meet the cost of sending the waste for incineration. Only Boots Ltd., a very large firm, were disposing of their waste "correctly" - they sent their waste to their own in-house incinerator in the Midlands. He suggested that the "experts" at OECD and Brussels for example should spend more time with the actual people involved rather than produce "expert" reports [91].

Ironically perhaps, district councils in Wales enjoy more contact with central government than their larger County Council counterparts in England. Contact with central government in Wales is via the Welsh Office, which is smaller and less forbidding than the DoE and relations between *wdas* and the Welsh Office is good. District councils would not, if local expertise did not exist, hesitate to contact the Welsh Office for

advice. In England, at the other extreme, the GLC, the largest County Council would not contact central government although the present head of the Hazardous Waste Inspectorate was previously employed at the GLC.

At the county council level there is a tendency to rely on local expertise although many county council do contact Harwell for advice. In general the advice provided by Harwell is very expensive and beyond the budgets of most *wdas*. However, under Treasury rules, Harwell scientists can provide one hours' worth of free advice on waste matters and receive many phonecalls daily which the Waste Management Information Bureau is able to deal with in less than an hour. As one Harwell official put it, this is not necessarily a reflection of our expertise but rather the types of questions asked and hence the level of ignorance [92].

In summary, the UK system is formally dependent for policy making (site licensing) implementation and enforcement upon local authorities. In reality, however, this network is technically, economically and institutionally very fragile and variable in effectiveness. There is little sense of consistency or professionalism in the institutional positions that matter for implementation. The feeling is that large industry at least regulates itself and even its 'regulators' and the system works overall because of the cultural and historical context of collaboration and mutual control upon which regulation in all fields tends to be based. There is little third party access or input.

6. CONCLUSIONS

The informal network at central government level to some extent is connected with the DoE's relationships with industry. The Land Wastes Division proudly claims over 200 man years of industrial experience amongst its 15 or so staff. They clearly define themselves as *collaborators* with industry, there to act as consultants rather than policemen. They even act as go-betweens for firms seeking treatment and disposal of difficult wastes, putting them in touch with operators who could help. They are keen to emphasize their extensive personal network of contacts throughout the industrial world they regulate and believe very strongly that regulation only works because industry wants it to work, and that mutual regulation through this elaborate and comprehensive informal network is the crucial component of the system.

Although there are many points in favour of this "gentleman's" approach based upon voluntary compliance and trust, there are also many loopholes, social and technical, in any regulatory scheme for hazardous waste that a general culture of compliance has to be nurtured even if it will inevitably have its ingenious deviants. The irony of the UK system and perhaps its greater failing, is that for all the formal reliance upon local responsibility, strength and autonomy, and informal reliance upon an apparently far-reaching diffuse interpersonal network, the key actors, the local authorities have access neither to, technical resources or standards, nor (with some exceptions) to the informal network centred upon the DoE, certain parts of the government scientific advisory establishments, and industrial experts.

Although this allows flexibility to tailor regulations to specific local conditions, there are at least three problems:

(i) there are virtually no standard principles consistent across the whole system which third parties (e.g., public interest groups) can check - the system is not accountable, even if it is operating in the public interest.

(ii) there is little impetus generated for regulatory initiatives beyond sound containment, e.g., recycling and production changes to take account of waste characteristics.

(iii) there is no institutional means for coordinating of waste arisings with facility investments to ensure reasonable matchings.

Whilst the UK system appears to work adequately at present, all of these factors may become more important in the future. Despite its apparent flexibility, whether the UK institutional framework can then adapt remains a moot question.

APPENDIX 1: UK EXCLUSIVE LIST UNDER DEPOSIT OF POISONOUS WASTE ACT, 1972

- Class 1* Any waste normally arising in the use of premises for domestic purposes.
- Class 2* Any waste normally arising in the use of premises as an office for any purpose, or as a retail shop (that is to say, a building used for the carrying on of any retail trade or retail business wherein the primary purpose is the selling of goods or services by retail).
- Class 3* Any other waste, however arising, of which the nature and composition are such that
- (a) if it arose in the use of premises for domestic purposes, it would fall within Class 1;
 - (b) if it arose in the use of premises as an office or retail shop, it would fall within Class 2.
- Class 4* Any waste produced in the course of—
- (i) the construction, repair, maintenance or demolition of plant or buildings;
 - (ii) the laundering or dry cleaning of articles;
 - (iii) working mines and quarries, or washing mined or quarried material;
 - (iv) the construction or maintenance of highways, whether or not repairable at the public expense;
 - (v) the dry cutting, grinding or shaping of metals, or the subjection thereof to other physical or mechanical process;
 - (vi) the softening, treatment or other processing of water for the purpose of rendering it suitable for (a) human consumption, (b) the preparation of foods or drinks, (c) any manufacturing or cooling process, or (d) boiler feed;
 - (vii) the treatment of sewage;
 - (viii) the breeding, rearing or keeping of livestock;
 - (ix) brewing;
 - (x) any other fermentation process; or
 - (xi) the cleansing of intercepting devices designed to prevent the release of oil or grease.
- Class 5* Any waste (not being waste in any of the foregoing classes) consisting of one or more of the following items whether mixed with water or not:—
- (i) Paper, cellulose, wood (including sawdust and sanderdust), oiled paper, tarred paper, plasterboard;
 - (ii) Plastics, including thermoplastics in both the finished and raw states, and thermosetting plastics in the finished state;
 - (iii) Clays, pottery, china, glass, enamels, ceramics, mica, abrasives;
 - (iv) Iron, steel, aluminium, brass, copper, tin, zinc;
 - (v) Coal, coke, carbon, graphite, ash, clinker;
 - (vi) Slags produced in the manufacture of iron, steel, copper or tin or of mixtures of any of those metals;
 - (vii) Rubber (whether natural or synthetic);
 - (viii) Electrical fittings, fixtures and appliances;
 - (ix) Cosmetics;
 - (x) Sands (including foundry and moulding sands), silica;
 - (xi) Shot blasting residues, boiler scale, iron oxides, iron hydroxides;
 - (xii) Cement, concrete, calcium hydroxide, calcium carbonate, calcium sulphate, calcium chloride, magnesium carbonate, magnesium oxide, zinc oxide, aluminium oxide, titanium oxide, copper oxide, sodium chloride;
 - (xiii) Cork, ebonite, kapok, kieselguhr, diatomaceous earth;
 - (xiv) Wool, cotton, linen, hemp, sisal, any other natural fibre, hessian, leather, any man-made fibre, string, rope;
 - (xv) Soap and other stearates;
 - (xvi) Food, or any waste produced in the course of the preparation, processing or distribution of food;
 - (xvii) Vegetable matter;
 - (xviii) Animal carcasses, or parts thereof;
 - (xix) Excavated material in its natural state;
 - (xx) Any other substance which is a hard solid and is insoluble in water and in any acid.

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