

WATER POLLUTION AND SEA DUMP OPERATIONS
IN CORK HARBOUR: A PRELIMINARY REPORT



Report by: Robert Allen
Bob Edwards

with: Andrew Booth
Dr Paul Johnston
Ruth Stringer

additional research: Eleanor Lambe

November 1988

Copyright Greenpeace Ireland Limited,
29 Lower Baggot Street, Dublin 2.

CONTENTS

1. The Precautionary Principle.....	1
2. Executive Summary.....	3
2.1. Industrialisation of Cork Harbour.....	3
2.2. Cork Harbour.....	3
2.3. The Role of the IIRS/EOLAS.....	4
2.4. Monitoring.....	4
2.5. Pfizer Chemical Corporation.....	5
2.6. Irish Refining Company Plc.....	6
3. Industrialisation of Cork Harbour.....	7
4. Cork Harbour.....	9
5. List of Companies Discharging into Cork Harbour.....	12
5.1. Little Island.....	12
5.2. Ringaskiddy and Other Areas.....	12
6. Legislation Governing Direct Discharge to Water.....	13
7. The Role of the IIRS/EOLAS.....	14
8. An Example of the IIRS's Assessment Procedure.....	15
9. The Impact of the Pfizer Chemical Corporation on Cork Harbour.....	18
10. Monitoring of Direct Discharges to Cork Harbour.....	20
11. Scientific Studies of Cork Harbour.....	22
12. Long Term Policy on Direct Discharges into Cork Harbour.....	24
13. Legislation Governing Sea Dumping.....	25
13.1. Pfizer Chemical Corporation.....	25
13.2. Irish Refining Company Plc.....	27
14. Confederation of Irish Industry (CII)/An Taisce Report.....	28
15. Industry and Public Information.....	30
16. Conclusions.....	32
Table 2. Companies Discharging into Cork Harbour.....	33
Table 3. Biological Oxygen Demand (BOD).....	39
17. References.....	40

1. THE PRECAUTIONARY PRINCIPLE

In November 1987 environment ministers from Belgium, France, Holland, UK, Denmark, Sweden and Norway agreed upon an urgent series of measures designed to reduce the amount of pollution entering the North Sea. The linchpin of that statement signed by all the North Sea states was the adoption of the precautionary principle towards the control of pollution.

The precautionary principle and the underlying reasons for its emergence can be summarised thus;

The problem

- * Logically, no matter how sophisticated the techniques, there can be no guarantee that the time scale for the prediction and prevention of environmental problems will be shorter than the realisation of those problems.
- * Practically, past experience tells us that action usually occurs only after harm, often very significant harm, has been done.

Therefore

- * If the risk of further damage is to be minimised, a precautionary approach is required; this can only mean taking action as a precaution, i.e. where it is acknowledged that a substance could cause harm, without scientific proof that it actually does cause harm.
- * As such it requires stronger action than a preventative approach, which implies preventing damage by a substance, which therefore, must mean that it is already known to cause harm.
- * A shift in policy from prevention to precaution can only mean a shift from proof of harm to proof of safety.

The realisation that the only hope of reducing the catalogue of past environmental disasters is a shift in the burden of proof is the most significant hallmark of the precautionary principle.

Alongside the agreement by member states to adopt the precautionary principle it was agreed as a matter of urgency to:

- 1 Reduce the discharge of toxic, persistent or bio-accumulative materials into the North Sea by 50% by 1995, and:
- 2 a) it is important to end the dumping of polluting materials in the North Sea at the earliest practical date;

b) as from 1 January 1989, no material should be dumped in the North Sea unless there are no practical alternatives on land and it can be shown to the competent international organisations that the materials pose no risk to the marine environment;

At the 2nd North Sea Conference Ireland, which only had observer status, issued a statement wherein they agreed that;

"a precautionary approach is necessary in relation to the control of inputs of the most dangerous substances from point and diffuse sources even before a causal link has been established by absolutely clear scientific evidence.

In addition Ireland reiterated its policy on sea dumping which reads as follows:

"Ireland allows dumping at sea only where this option is considered environmentally acceptable and is the only practical solution available for disposing of the materials involved"

At present Greenpeace can find no evidence to suggest that the Irish government have altered existing law or practice to reflect their adoption of the precautionary principle. A very necessary first step if Ireland is to adequately protect her inland and coastal waters.

In addition, as will become apparent on considering current industrial and sewage dumping operations those presently licensed operations are not the 'only practical solution available' and as a consequence should be terminated.

2. EXECUTIVE SUMMARY

2.1. Industrialisation of Cork Harbour

There are currently some 16 industrial premises consented to discharge in excess of 11 million tonnes of effluent to Cork harbour every year. The greatest concentration of factories is in the Little Island Industrial Estate where 11 companies discharge into a communal sewerage system. This complex produces a highly variable effluent into the river Lee including up to 10.9 tonnes of heavy metals and 29 tonnes of toxic organic chemicals every year. The total 'waste' content of the discharge is poorly defined and the authorities set limits for only 28 parameters with no reference being made to any pharmaceuticals or their by-products. Since in general up to 10% of the product may be lost in the manufacturing effluent and discharged as waste this lack of control is of considerable concern. When this lack of control on materials which by their very nature can be expected to be highly biologically active is examined in the light of the absence of analytical techniques to qualify the amount present in the environment, concern becomes alarm.

The other industries discharging effluent into the estuary are located at Ringaskiddy in the outer harbour. In addition, the sewage from Cork city (population 136,000) is discharged in a largely untreated state to the estuary by way of the river Lee. This is a discharge which is expected to increase dramatically in future with the growth of Cork city and the nearby towns of Carrigaline and Middleton.

2.2. Cork Harbour

The flushing time of Cork harbour is long with contaminants, although well dispersed in the body of the estuary itself, demonstrating extended residence times. This has been borne out by evidence that copper and zinc are higher in specimens of the seaweed of the fucus group found close to Cork city than those found further away. Indeed, the concentration of zinc found in seaweed in Cork was higher than that in the Bristol Channel, one of the most heavily industrialised estuaries in Britain. Since the dispersal of effluent within Cork harbour is good, perturbations in community structure are more likely to be attributed to natural trends than would be the case if the polluted areas were better defined and may pass unrecognised until they are far advanced. This problem is further complicated by the fact that no research is being carried out on the benthos of muddy areas within the harbour where contaminants will accumulate more readily. With no baseline data on these regions establishing the effect of pollution on organisms that inhabit them is made extremely difficult. Indeed, University College, Cork (UCC) have identified an urgent need to conduct a long term study over 20 years to allow a clear appraisal on the effect of industry on the estuary. UCC have suggested that industry in the area contribute to a super-fund to allow such a study to be conducted.

2.3. The Role of IIRS/EOLAS

The role of the IIRS/EOLAS is examined in the light of recent government cuts and concern expressed at the agency's dependency on industry-funded contract work. The conflict of interest which this dependency generates is of great concern with regard to one of the agency's most important functions which is to:

"assess the nature, quality and quantity of all effluent waters discharged from proposed new industry or from the expansion of existing plant".

Although Greenpeace was unable to obtain copies of water impact assessments which we presume are conducted by EOLAS we did obtain a copy of a toxicity test conducted by IIRS in July 1978 on waste emanating from Gaeleo Limited. Examination of the testing protocol adopted by IIRS revealed a number of inadequacies. In particular:

(1) The test organism used to determine the effect of the effluent to be discharged into an estuarine environment was a freshwater fish. A fish which cannot adequately express the possible effects of the effluent on the ecosystem as a whole.

(2) No chemical determination of the effluent was conducted using advanced analytical techniques.

(3) There was a marked lack of any statistical treatment of the data. It is not true, as alleged in the leaked document, that the data obtained was not amenable to statistical interpretation. There are a number of non-parametric techniques available.

If this test, and the protocol it follows, is characteristic of those once conducted by IIRS and now by EOLAS then considerable doubt is thrown upon the agency's ability to gauge the environmental effects of industry on the communities of animals present in Cork harbour. The considerable shortcomings of the protocol used by the IIRS in July 1978, if characteristic of those conducted by EOLAS, when considered in association with the poor monitoring strategies extant within Cork harbour seriously questions the ability of the regulating authorities to adequately protect the estuary.

2.4. Monitoring

Whilst companies are obliged to conduct analyses for specific pollutants in their waste, in general, they are only required to analyse regularly for five-day biological oxygen demand (BOD), chemical oxygen demand (COD) and pH. This provides wholly inadequate characterisation of the waste entering Cork harbour. In addition toxicity tests conducted by EOLAS appear extremely limited in scope providing only acute toxicity information. There is no indication of possible long term sub-lethal effects, or the effects of combined effluents such as those released by the IDA pipeline. Monitoring data presently held by local IDA pipeline. Monitoring data presently held by local government is not available to the general public and it is our considered opinion that it should be.

Monitoring and enforcement of consents to discharge into the estuary are examined. At no stage in the last twenty years has any of the pharmaceutical/chemical companies operating in Cork been prosecuted for contravening their consents.

The effect that the chemical, organic, agricultural and domestic effluent has on water quality and marine life in the estuary was only properly addressed in the 1970s, by which time several chemical plants had already established themselves. When scientific studies were commenced UCC showed that marine life was being adversely affected; that monitoring strategies developed lacked comparative baseline studies and suffered as a consequence of the inconsistency of methodology applied. In a report to be published later this year scientists from UCC found that up to 67.1% of the 22 species of fish examined in Cork harbour showed some sign of disease. Attempts by UCC to create an infrastructure to monitor Cork harbour appear to have been discouraged by industry in this area.

2.5. Pfizer Chemical Corporation

The impact of the Pfizer Chemical Corporation is examined. The manufacture of citric acid involves the creation of large quantities of residues from molasses and glucose-based fermentation processes. The waste streams which arise from the citric acid plant, effluent from the factory sewage treatment plant and floor washings from the organic synthesis plant containing chemicals and dissolved solvents are discharged into the harbour under licence from Cork County Council. Additional waste is dumped at sea under licence from the Department of the Marine.

In order to comply with its licence to discharge, Pfizer was required to construct a bio-oxidation plant. As far as Greenpeace knows this stipulation has not been met.

In 1970 a team of independent consultants (Metcalf and Eddy) surveyed Cork harbour for Pfizer and made recommendations for efficient disposal. The report concluded that the Pfizer jetty site for waste disposal is not a long term location for disposal of chemicals because of the low assimilative capacity of the site. It recommended the construction of a new pipeline to discharge into the main channel. Greenpeace can find no evidence that such a pipeline was constructed.

Pfizer is licensed to dump 1.3 million tonnes of organic waste annually in a site 16 miles south of Cork. It is the largest dump site in the North East Atlantic and its total BOD load, when considered in 1977, was found to be equivalent to the total BOD load of the whole of the Republic of Ireland. Compliance with consent conditions for the sea dump is monitored by the Department of the Marine but details are not available to the public. It is the considered opinion of Greenpeace that these details should be released.

An internal report leaked to Greenpeace identifies the existence of alternative methods of production for citric acid which, if introduced, would negate the need for sea dumping. The leaked

document clearly indicates that sea dumping was chosen because it was the cheaper option and could be considered in Ireland because of the 'unadvanced state of legislation'. Information Greenpeace has obtained this year from Pfizer in the United States indicates that the alternative production process for the production of citric acid entitled 'The Citcon Process' is not only available to the company but produces a saleable item - a food supplement for cattle and horses. In addition to removing the need for sea dumping the Citcon Process reduces the BOD of the remaining effluent produced by 90%.

2.6. Irish Refining Company Plc

The only other industrial waste sea dumping operation licensed is that conducted by the Irish Refining Company. It is licensed to dump 6,000 tonnes of caustic soda at the same site used by Pfizer. The waste dumped is contaminated with polynuclear aromatics and other hydrocarbons and represents a toxic threat to marine life. Greenpeace has contacted refineries in other nations to examine if there is a need for the dump to continue and discovered that none existed. Technology is presently available to allow caustic soda to be re-injected into the distillation unit and avoid waste generation.

3. THE INDUSTRIALISATION OF CORK HARBOUR

The industrialisation of Cork harbour began, ostensibly, with the creation of the Cork Economic Development Council as a voluntary body in 1957. It was re-constituted in 1964, with the development of industry in Cork city and county as the major objective. The following year, in conjunction with Cork Corporation, the County Council, the Cork Harbour Commissioners and the Cork Chamber of Commerce, it employed a full-time secretariat and in 1967 the Cork Harbour Development Plan was drawn up.

The Industrial Development Authority (IDA), founded in 1949 with the responsibility for the furtherance of industrial development in Ireland has, since the early 50s, encouraged foreign industry to locate in Ireland, spending over £200 m a year on assistance, mostly in the form of incentives. "The aids and incentives offered by the IDA are weighed in favour of firms which intend to locate or expand in areas of high unemployment, and pharmaceutical companies have been encouraged to base themselves in the area around Cork and its harbour" [1].

Ireland is the 15th largest producer of pharmaceuticals in the world and Cork harbour has the highest concentration of these facilities in the country.

Explaining why the IDA specifically chose the pharmaceutical/chemical industry the Minister for Industry, Commerce and Tourism, Desmond O'Malley TD, said in 1980 that the pharmaceuticals/fine chemicals sector was the most suitable manufacturing industry for the Irish economy. "The IDA specifically recruited healthcare companies because of their profitable product lines, employment of skilled and semi-skilled labour, their ability to introduce technology and their tendency to resist downturns in the business cycle. In addition the high value to volume ratio means that products could be economically exported to the EEC and elsewhere" (see Table 1) [2].

"The IDA's strategy was to encourage industries which would be suited to the education and skills of our workforce; employing graduates and technicians, making Ireland less vulnerable to competition from low cost producers. All three criteria were met in practically all cases by the healthcare industries in general and the pharmaceutical/fine chemicals sector in particular" [2].

Table 1. Investments, exports and employment (compiled from IDA figures).

YEAR	INVESTMENT	EXPORTS	EMPLOYMENT
1971	£33.2 M	£16.6 M	2,396
1979	£334.4 M	£403.9 M	10,000
1987	£770 M	£1.337 B	18,000

"Ireland is reputed to be the most profitable industrial location in Europe as a result of its financial incentives, its high productivity levels and relatively low labour costs" [1]. The IDA has also stated that Ireland offers a rate of return on investment which can be "up to three times higher than

alternative European locations, while investment payback is said to be achieved twice as quickly as in other countries" [3].

As the seventies merged with the eighties the IDA was able to offer foreign companies attracted to Ireland more than just financial aid and incentives. In Cork, it was able to offer land on state-owned sites, in Little Island which is now almost full and on a 1,000 acre site in Ringaskiddy; 600 acres of which are still vacant.

4. CORK HARBOUR

Ireland is heavily indented along its 5,628 km coastline (at the high-water mark) with approximately 32 estuaries and coastal bays. Most of Ireland's estuaries are significant as breeding and rearing grounds for shellfish, particularly mussels and oysters, and innumerable species of fish. Migratory fish, such as salmon and sea-trout, reach the sea from their fresh water rivers through estuaries and there is an abundance of marine life in all of these regions.

The port of Cork is a sheltered deepwater harbour with the seaward limits extending to an imaginary line drawn between Power Head on the eastern approach to the harbour and Cork Head to the west. Like most Irish estuaries Cork is secluded and deeply indented. The port itself stretches 12 miles from the entrance to Cork city, and ships passing into the docks must navigate around Whitegate to the east and Ringaskiddy to the west before reaching a long narrow channel which opens out at Passage West and Marino Point. A sharp turn west brings shipping traffic past the Douglas estuary and Little Island to the north and finally past the Tivoli docks to the port of Cork.

Most of the industrial concentration, including chemical and pharmaceutical facilities, are located on Little Island where two IDA pipelines and a sewer discharge effluent from 11 plants. IFI's fertiliser plant is situated on the narrow section of the channel at Marino point. The other industries discharging effluent into the estuary are at Ringaskiddy in the outer harbour.

Dr Paul Johnston, Greenpeace Research Fellow at Queen Mary College, London makes the following observations on Cork harbour and the discharge of effluent:

"Though the currents through the East and West Passages are generally strong and will tend to disperse pollutants quite widely from the point of discharge, the flushing time of the whole harbour is very long. In particular, contaminants discharged to the inner harbour will have extended residence times. This has been borne out by evidence that zinc and copper, which accumulate slowly in seaweeds, are already higher in specimens of *Fucus* collected close to Cork city than those further away. As a consequence of the dispersal of effluents, contaminant levels will tend to rise gradually throughout the harbour over a period of time. Perturbations in the community structure of the harbour as a result of pollution will therefore be more likely to be attributed as natural trends than would be the case if the polluted areas were better defined and may pass unrecognised until they are far advanced. This problem is further exacerbated by the fact that no research is being carried out on the benthos of the muddy areas of the harbour, where contaminants will accumulate more readily. With no baseline data on these regions, proving that pollution has caused an effect on the animals that inhabit them is extremely difficult".

"There are currently some 16 industrial premises consented to discharge in excess of 11 million tonnes of effluent to Cork harbour each year. In addition, the sewage from Cork city (population 136,000) is discharged in an untreated state to the

estuary of the River Lee. This is an input which will increase rapidly in the future with the growth of Cork city and the nearby towns of Carrigaline and Middleton. Population is expected to increase in these areas as more companies move to the Cork area".

Privately many observers, critics, academics and local authority officers believe that the sewage which is discharged into Penrose Quay and Kennedy Quay and which is monitored by Cork Corporation may be more damaging than the chemical effluent. A scheme, put into operation in 1984, which collects all the sewage north of the north channel of the river Lee and south of the south channel of the river has, according to the Corporation, alleviated many of the former problems with sewage, which were once discharged at numerous outlets all over the city. Today the Corporation estimate that 5,000 BOD kg/day of industrial sewage and 7,000 BOD kg/day of domestic sewage is discharged into the Lee.

Treatment also appears to be a problem and according to the Corporation they have no plans to treat the sewage presently being discharged into the estuary, even though Iain Maclean, Chief Environmental Officer, Cork County Council and others see it as a priority. The reason given is lack of funds.

Lack of funds are also the reason why no major sewage scheme has been initiated in Cork. The Water Pollution Advisory Council recommended that public sewage treatment schemes be considered as a matter of priority "in a pollution abatement programme". Cork Corporation confirmed this plan but said it would be some years before such a scheme would be built in Cork.

Responding to the recent UCC studies (see pp. 22-23) Maclean said it was difficult to attribute the fish disease in Cork harbour to any particular pollutant. "It is possible it could be industry but it could be sewage", said Maclean [4].

Dr Johnston further states:

"The greatest concentration of factories occurs at the Little Island Industrial Estate. There, 11 companies discharge their wastes via a communal sewerage system. This introduces a highly variable effluent to the River Lee estuary. Up to 10.9 tons of heavy metals and 29 tonnes of toxic organic chemicals may be released from this one source on a yearly basis. Annual COD and 5-day BOD loadings of 507.2 and 345.6 tonnes respectively are allowed. The consents set limits for 29 parameters other than pH and temperature. However, this by no means defines the total content of the discharge. Several of the facilities on this and other sites manufacture pharmaceuticals and a mixture of starting materials, by-products and end products of these processes will inevitably be released. These compounds are so diverse that it is impossible to characterise the waste, much less monitor what is being released or elucidate its toxic effects. Further problems may arise from the common solubility difficulties encountered in pharmaceutical manufacture. It is generally not possible to recover all the product and up to 10% may be lost in the manufacturing effluent. Generally, analytical facilities do not exist to deal with these materials which by their very nature may be expected to be highly biologically active".

"COD and BOD-5 represent a significant loading to the harbour. Reduction in the dissolved oxygen levels will compromise sensitive species of fish and invertebrates and favour those which are able to tolerate less well oxygenated conditions".

"Most of the organic solvents in use in the pharmaceutical industries in Cork harbour in particular and in the Republic of Ireland in general have to be reclaimed and re-used, with unrecoverable residues being exported for destruction. This occurs only because there are no suitable treatment facilities available in Ireland and artificially lowers the environmental impact of the use of these chemicals. However, increasing costs and tightening of legislation on the trans-frontier movement of such wastes as well as capacity problems at the foreign facilities currently used will force the treatment of these wastes in Ireland".

"The Department of the Environment and Irish Environmental Services are investigating the possibilities of building a hazardous waste incinerator in anticipation of this. Such a facility would have significant impact through discharges to watercourses and the atmosphere and would require landfill sites for the disposal of contaminated fly-ash. Cork, with excellent harbour facilities and its polity of encouraging industry, must be considered a potential site for such a project. The wastes currently exported for treatment comprise halogenated solvent wastes and still residues from the reclamation processes used".

"The incineration of these materials inevitably results, even with the current generation of high temperature incinerators, in the emission of the highly toxic dioxins and dibenzofurans. In addition a wide spectrum of other products of incomplete combustion (PICS) and secondary combustion products are released. Many of these are known to exert deleterious health effects. Some impact assessment studies originating in Scandinavia suggest that even if emissions are kept to what is technically achievable, breast-fed infants may receive more than the tolerable intake of some of these compounds through the mothers milk".

5. LIST OF COMPANIES DISCHARGING INTO CORK HARBOUR

5.1. Little Island

Cara Partners Ltd
FMC (Ireland) Ltd
Gaeleo Ltd
Glanmire Industries Ltd
Henkel Ireland Ltd
Irish Fher Laboratories Ltd
Janssen Pharmaceuticals (I) Ltd
Mitsui Denman (Ireland) Ltd
Plaistow Ltd
Wexport Ltd
Yates Industries (Ireland) Ltd

5.2. Ringaskiddy and other areas

Angus Fine Chemicals Ltd
Irish Fertilisers Industries Ltd
Irish Refining Plc
Penn Chemicals B.V.
Pfizer Chemical Corporation

(See Table 2 for further information on these companies.)

6. LEGISLATION GOVERNING DIRECT DISCHARGE TO WATER

The control of water pollution in the Republic of Ireland is essentially entrusted to local authorities by means of the Local Government (Water Pollution) Act 1977. The control of sewage discharges is entrusted to the relevant sanitary authority under the same act.

Generally, the Act is long on good intention but short on obligation. The Act states that "a person shall not cause or permit any polluting matter to enter water" and "a person shall not ... discharge or cause or permit the discharge of any trade effluent or sewage effluent to any waters except under and in accordance with a licence under this section". Yet elsewhere it states that "it shall be a good defence to a prosecution under this section to prove that the person charged took all reasonable care to prevent the entry prohibited under sub-section (1)".

There are many uses of the word "may" but less uses of "must" or the equivalent. "The Minister may ... make regulations requiring water authorities, sanitary authorities, and boards of conservators to consult with such persons and in such manner in relation to the exercise of such powers and duties under this act as may be proscribed". In the next sub-section the Act states "The Minister may, after consultation ... by order establish, in respect of such area as is specified in the order, a water quality control authority". Surely the creation of such bodies should be made obligatory.

Similarly, and more importantly, the Act states "A local authority shall not grant a licence under this section in respect of the discharge of an effluent which would not comply with, or would result in the waters to which the discharge is made not complying with, any relevant standards prescribed under section 26". Yet the creation of such standards is not made obligatory under section 26. "The Minister may ... prescribe for the purposes of this Act quality standards for waters, trade effluents and sewage effluents and standards in relation to methods of treatment of such effluents".

Fortunately the Irish Government is obligated under the Treaty of Rome to implement EC Directives and in July 1988 the Irish Government implemented Directive 86/280 which states "Whereas, since pollution due to the discharge of these substances into the aquatic environment is caused by a large number of industries, it is necessary to lay down specific limit values for discharges according to the type of industry concerned and to lay down quality objectives for the aquatic environment into which these substances are discharged". Unfortunately the legislation is not retrospective. It is also debatable whether Ireland complies with many EC Directives.

Whatever standards apply in the Republic of Ireland have been formulated by the IIRS now reconstituted as EOLAS.

7. THE ROLE OF THE IIRS/EOLAS

The Institute for Industrial Research and Standards (IIRS) was a state-sponsored body responsible to the Minister for Industry and Commerce.

It provided the following services:

- (1) Field advisory service: technical services provided to industries concerned with pollution;
- (2) Process development service: designing and developing pollution control processes for industry;
- (3) Equipment development service;
- (4) Laboratory service; and
- (5) Standards advisory service.

"The IIRS is particularly concerned with problems relating to pollution by industrial effluent and its role embraces the carrying out of research, advisory and testing work for industrial organisations or for others when requested on methods of treatment of industrial effluent, and to advise, as required, the IDA in this matter with regard to the siting of new factories, and to carry out research and development with regard to the utilisation of industrial wastes. The IIRS has published standards for effluent treatment which are widely used by pollution control authorities" [5].

The IIRS always maintained a very close relationship with the IDA and most of its clients were international companies referred to them by the IDA. Regarding the discharge of effluent the IIRS and the IDA had an agreement which required the IIRS to "assess the nature, quality and quantity of all effluent waters from proposed new industry or from proposed expansion of existing industry" [5].

The IIRS also collected relevant information on receiving water or local sewage systems and recommended treatment standards for the effluent according to governmental guidelines set out in 1970.

The IIRS was constantly criticised by environmental groups because, although it was a semi-state body, it had no real independence. "The role of the IIRS in the field of pollution control is, however, suspect. It derives a substantial proportion of its income from private industry, and there appears to be a potential, if not an actual, conflict of interests in this body which advises both controlling authorities and those who are likely to cause pollution" [5].

In 1987 the IIRS was merged with the National Board of Science and Technology (NBST), whose brief was science policy as compared to the IIRS whose brief was technical, to create EOLAS which in Irish means 'knowledge'. In the light of recent governmental cuts EOLAS has become even more dependent than the IIRS on the contract work.

8. AN EXAMPLE OF THE IIRS'S ASSESSMENT PROCEDURE

Before granting permission for each company to commence production and discharge into the marine environment we presume that the IIRS conducted some form of water impact assessment. We have been unable to obtain copies of these assessments except for a toxicity test conducted for Gaeleo Ltd by the IIRS in July 1978 (The Acute Toxicity of a Pharmaceutical Manufacturing Effluent [Gaeleo Limited] to the Brown Trout [Salmo trutta] at 15 C).

Dr Paul Johnston, Greenpeace Research Fellow at Queen Mary College, London states:

"Whilst some companies are obliged to conduct analyses for specific pollutants in their waste, in general the companies are only required to analyse regularly for 5-day BOD, COD and pH. These provide a wholly inadequate characterisation of the effluent discharges. Furthermore, the monitoring data held by the local government are not available to the public".

"The majority of companies wishing to obtain a consent to discharge waste into the harbour system are obliged to have a toxicity test carried out on their effluent. These tests are frequently very limited in scope, usually consisting of LD50 determinations of the waste using a standard test organism such as *Salmo trutta* or a marine organism specified by the local authority. These tests will merely provide acute toxicity data regarding the effluent. They provide no indication of the possible long-term sub-lethal effects these effluents might have on the indigenous communities and their structure. Nor do these tests assess the toxic effects of combined effluents, such as that released from the IDA pipelines. The possibility of interactions between, and synergistic effects of substances in such a discharge is overlooked".

"There is some evidence to suggest that these toxicity tests may be improperly conducted. Examination of the protocol and results for the toxicity testing of the manufacturing effluent from Gaeleo Ltd, conducted by the IIRS reveal the following points of concern:

(1) The test organism used is *Salmo trutta*. This is a freshwater fish. It therefore cannot be regarded as adequately expressing possible effects upon the ecosystem as a whole. Further, the effluent is discharged to salt or brackish water. It is well known that the toxic responses of salt water and estuarine animals may differ markedly from freshwater organisms. The euryhaline crab species *Carcinus maenas* also used as a test organism is known to be relatively resistant to many toxic compounds and therefore results from these tests are not likely to realistically reflect ecosystem effects in the receiving waters for such effluents.

Further, acclimation of the test fish to the Shannon water supply may introduce an artefactual response if the test solution contains appreciably different levels of calcium ion. Water hardness is known to significantly affect the response of these fish to toxic dissolved substances.

(2) It is noted that the effluent supplied was not homogeneous and differed in toxicity. It was therefore blended for the purposes of testing. The correct procedure would normally be to evaluate all samples to obtain a range of toxicity. The desirability of this follows from the fact that the most toxic discharge likely must be considered since this will be expected to exert the greatest ecosystem effect.

(3) No precautions were taken to prevent leaching of materials from the plastic containers used for transport.

(4) Static test procedures were used and the tanks were aerated. No replacement of test solutions was carried out. The need for aeration arises from the test species used being highly sensitive to dissolved oxygen levels. However, aeration may effectively reduce the toxicity of the effluent by 'air-stripping' potentially toxic volatile materials. Under these circumstances the choice of test animal must be regarded as inappropriate. Further, it is noted in the protocol that the effluent had a tendency to form a light floc under aeration. This implies that chemical changes were taking place which in turn may have modified toxicity.

(5) No chemical determination using advanced analytical methods was apparently used on the effluent.

(6) The most serious problem evident from the recorded protocol is the lack of statistical treatment of the data. Firstly, it is generally accepted that such experiments should report not only the 96hLC50 but also the incipient lethal level from a dose response curve constructed from sufficient data to allow identification of the asymptotic region. This implies that the experiment must be maintained for substantially longer than 96 hours. The system of bracketing concentrations as used in this protocol is unnecessary and wastes experimental material.

Using a longer experimental time also allows the identification of any phasing of toxic effect as evidenced by split probit lines if this form of analysis is used. Secondly, it is simply not true to say that the data obtained were not amenable to statistical interpretation. There are a number of non-parametric techniques available. However, the fact that all test animals died during the hours of darkness implies that some phasic toxic action took place. This is not unlikely in the case of pharmaceutical effluent which may contain materials which exhibit a mode of action associated with the circadian rhythms of the test animals. The test should have been at least partially replicated in order to further study this. The lack of replication of tests is also a serious shortcoming of this test procedure. Normal practice is to perform replicates with the aim of determining 96hLC50 values which fall within the 95% confidence limits of the tests conducted".

"In conclusion therefore the toxicity testing procedure described for this effluent has a number of serious shortcomings which throw considerable doubt upon its suitability for gauging environmental effect upon the communities of animals present in Cork harbour. The present scheme needs extensive review and application of far more rigorous techniques. The use of trout as

a test animal should also be reviewed since it is unlikely that they or the alternative animals used are the most sensitive species of the receiving system. The most usual problem encountered with fish toxicity testing procedures is that while they provide a means of evaluating the more toxic effluents they are limited in application for what are regarded as less toxic effluents, and in many cases do not allow calculation of suitable application factors. Regulatory authorities generally recommend that fish acute tests in bio-monitoring studies are determined for suitability on a case by case basis and supplemented with invertebrate tests. The latter are also much more useful for chronic toxicity assessment. Ultimately however an animal community sampling study should be undertaken in the field to assess the before and after discharge effects. Account must also be taken of the general hydrographic conditions in the receiving basin".

9. THE IMPACT OF THE PFIZER CHEMICAL CORPORATION ON CORK HARBOUR:

Pfizer was the first success in the IDA's campaign to draw industry to Ireland. The Pfizer Chemical Corporation was established at Ringaskiddy in 1969 allegedly "after the refusal by the authorities in the United States and the United Kingdom to grant planning permission for a chemical complex to manufacture citric and associated products". The company was attracted to Ireland by grants reported to be approximately £7.5 million to build a plant next to the deep water berth in Cork harbour and has since become a valued contributor to the economy of Cork by employing some 590 people.

The company has spent money to create a positive environmental image. Anyone driving by the plant will see a model of landscape planning. The 170 acre site includes a nine hole golf course and a sports club. The company has won the 'Garden of the Year' competition and was nominated this year as the best kept industrial site in the Cork region. The plant abounds with signs exhorting the workforce to be aware of industrial safety practices.

However, behind this pleasant facade lies continued controversy over disposal of wastes from the various manufacturing processes. The manufacture of citric acid involves the creating of large quantities of residues from molasses and glucose based fermentation processes. The weak waste streams from the citric acid plant, effluent from the factory sewage treatment plant and floor washings from the organic synthesis plant containing chemicals and dissolved solvents are discharged into the harbour under licence from Cork County Council. Solids and what Pfizer calls "strong sweet" are dumped at sea under licence from the Department of the Marine.

Originally, effluent from the Organic Synthesis Plant was incinerated. This led to objections from local residents in Monkstown due to emissions of black smoke and noxious fumes and the practice was discontinued after a couple of months in 1972. An internal Pfizer report obtained by Greenpeace recognised this problem. "The effluent from this plant was originally intended to be incinerated, but this has proved to be operationally unsatisfactory. We have, however, determined that bio-oxidation is a practical alternative, using a cocktail of bacteria especially developed for organic plant effluent" [6]. Elsewhere in the report, with reference to the construction of a bio-oxidation plant the report states: "This is the one area in which we are at variance with our consent conditions and about which we need to do something in the immediate future". This report dates from 1977 but Greenpeace can find no reference in the Cork County Council planning department to such a plant having been constructed.

In 1972 conservation groups forced Ireland's biggest public enquiry to date when Pfizer applied for outline planning permission to discharge 136,000 kg of effluent per day (ten times the amount originally agreed in 1969) into the harbour. According to An Taisce the quantity of effluent would place an impossible BOD on the harbour and endanger marine life. Also, and for example, the levels of manganese that Pfizer is consented to

discharge (in a concentration of 500 mg/l) would dangerously accumulate in any shellfish grown in the vicinity. Greenpeace scientists have calculated that the company is consented to discharge effluent having a BOD of over 4,800 tonnes per year.

In 1970 Pfizer commissioned a firm of consultants, Metcalf and Eddy, to survey Cork harbour in terms of its waste disposal policy. "The objective of the survey was to obtain, with the minimum of field time and measurements, an overall understanding of the pattern of harbour currents under various tidal conditions and a general documentation of the effects upon the harbour of pollution and waste heat discharges by others. These preliminary data would then be used as a guide in locating trial positions for a future Pfizer outfall discharge point. Waste dispersal characteristics would be checked under various tidal conditions for each trial location and compared with dispersal characteristics at the Pfizer jetty at Ballybricken ... Circulation was found to be excellent in the deep channels and poor in the Monkstown, Ballybricken and Ringaskiddy areas ... Many eddies developed in the Ringaskiddy area during slack tides, and much of the tidal cycle consisted of sluggish movement among the islands ... False-colour photographs were studied and revealed high algae growths on the mud banks in the Owenboy river and Monkstown Creek area".

The report concluded that: "The Pfizer jetty site is not a long-term location for disposal of Pfizer wastes because of the probability of a localised build-up of waste concentrations in the adjacent embayments and the shallows to the south of Haulbowline island. The assimilative capacity of the Lower harbour is also less in this area than at Spike Island". Metcalf and Eddy recommended the construction of a pipeline into this area of the main channel. Greenpeace has no evidence that any action has been taken to construct this pipeline for Pfizer's use. An IDA pipeline exists on navigation charts but is used for sewage and other industries.

10. MONITORING OF DIRECT DISCHARGES TO CORK HARBOUR

Under section 22 of the Local Government (Water Pollution) Act 1977 a local authority or sanitary authority:

"(a) Shall carry out or cause to be carried out or arrange for such monitoring of water and discharges of trade effluents and sewage effluents ... as it considers necessary for the performance of any of its functions under this Act or as may be directed by the Minister.

(b) May collect, cause to be collected or arrange for the collection of such information as it considers necessary for the performance of any of its functions under this Act or as may be directed by the Minister."

In short, the local authority acts as both legislator in terms of granting licences to discharge to the aquatic environment and controller of these discharges with no definition or even guidelines to monitoring criteria.

The local authority monitors according to the discharge licence. It looks only for what is on the licence because only a breach of the effluent limits on the licence would permit them to prosecute. At no stage over the past 20 years has the local authority taken action against the pharmaceutical/chemical industry in Cork harbour.

According to figures provided by Iain Maclean, Chief Environmental Officer, Cork County Council, the local authority has instigated 18 prosecutions, under the auspices of the WPA, 17 of which were successful. All of these were for fish kills, against farmers, small industries and agricultural co-ops.

The local authority claims it has all the equipment needed to monitor the estuary adequately. However Maclean admitted that they are fairly dependent on EOLAS. "I'd like more in-house equipment". Maclean also added that "from a chemical point of view there was very little they could not do, but if we were dealing with larger quantities that would be a problem. You have to remember that we are dealing with mostly fine chemical companies who are quite small" [4].

Monitoring the effluent discharge depends on the individual industry and is conducted a minimum of 12 times a year. The monitoring, however, is random. "We try to monitor all the major discharges once a month and try not to do it at the same time every month, we try to keep it random, sometimes turning up a few days later" said Maclean [4].

Monitoring data is compiled by the local authority but it is not made available to the public and there is no legislation to provide for such a facility.

(See also pp - , An Taisce/CII Joint Report.)

Greenpeace finds this situation totally unacceptable in comparison with legislation in other EC countries. For example,

water pollution is controlled in the UK by The Control of Pollution Act 1974 and while there are many shortcomings in this Act and its implementation, at least from publicly accessible records, we can see what is being discharged and how it is being monitored and regulated.

11. SCIENTIFIC STUDIES OF CORK HARBOUR

As early as 1975, before much of the present concentration of pharmaceutical and chemical industry came to Cork and its harbour, the IIRS published a national study of water and air pollution on behalf of the IDA. The study found that there was no sign of pollution emanating from the new industries. It did, however, state that agricultural related industries and activities were responsible for 90% of water pollution.

In Cork, several studies were compiled in the seventies, notably a report on the quality of the water in Cork harbour by consultants M.C. O'Sullivan which was commissioned by the local authority. It was published in 1978 based on tests completed in 1976. Subsequent studies, also commissioned by the local authority in 1981, 1984 and 1987 have shown that there has been "no significant difference in the water quality" [4].

Adding to the IIRS study on the water quality, which was published in February 1974, the following limits were put on the amount of effluent that could be discharged at particular points in Cork harbour [7]:

IIRS: 20,000 lbs BOD/day at Little Island

O'Sullivan: 90,000 kg BOD/day at Ringaskiddy
 14,000 kg BOD/day at Rathscorcev
 30,000 kg BOD/day at Passage.

"BOD figures, of course, reveal only 'one side of the coin' and the use of BOD data to the exclusion of all other types of data is a symptom of the obsession with the assimilability which has dogged unenlightened pollution monitoring methodology in the Republic of Ireland for years" [8].

Until M.C. O'Sullivan's baseline general survey of the water quality and dilution capacity of the estuary in 1978 and the introduction of the Water Pollution Act (1977) the local authority had no parameter by which to gauge the amount of effluent being discharged into the harbour.

The effect that the chemical, organic, agricultural and domestic effluent has on the water quality and marine life of the estuary was only properly addressed in the seventies by which time several chemical plants had already set up.

The Local Government (Water Pollution) Act 1977 gave the local authority power to grant licences for the discharge of effluent which could be reviewed every three years, with added limitations if necessary, and the power to impose new conditions in the case of future developments which would supersede the original conditions.

When scientific studies commenced in the seventies the UCC academics and students from the Zoology, Botany, Plant Science and Social Theory & Institutions department's results showed that the marine life was being adversely polluted. However, the lack of comparative baseline studies and inconsistency of methodology has prevented the authors of these reports from relating their

findings to any specific cause. The scientists also stress that their reports cannot be taken in isolation and argue that only a continuous study over, for example, 20 years involving a large team of workers would show conclusive evidence that the effluent is damaging the marine life.

Of particular interest are the studies by the UCC Zoology department and significantly a comprehensive survey of fish life in the estuary by Professor M. Mulcahy and Catherine Maye's thesis 'Pathobiology of Fish in Cork Harbour'. In 1980 the pathobiology panel of the International Council for the Exploration of the Sea (ICES) recommended that countries should look at their coastal waters and attempt to seek a biological method to determine sub-lethal effects on marine organisms.

Professor Mulcahy, whose initial study 'Pathobiology of Estuarine Fish and Shellfish in Relation to Pollution' found that there was a high level of disease among fish in Cork harbour, will be announcing her concluding report later this year. In her thesis Catherine Maye noted that of a total of 2,559 fish (22 species) examined 1,718 (67.1%) showed some sign of disease [9]. She wrote that "the high level of disease in Cork harbour, if considered to be related to degraded environmental conditions, probably is due to a high level of organic loading rather than chemical pollution. This is evidenced by the high prevalence of low grade disease present in Cork harbour of types previously associated with organic pollution such as finrot and ulcers".

In studies by J.P. Cullinane, P.M. Whelan and T.M. Doyle in 1982 and 1987 which looked at heavy metals in seaweeds their results showed that there was a high level of zinc in the estuary. The second study 'Uses of Seaweeds as Biomonitors of Zinc Levels in Cork Harbour' showed that at Douglas estuary the metal was higher than for a comparable study in the Bristol Channel (Fuge & James, 1974). "Factors that may be responsible for the high levels (of zinc) near Cork city and Douglas include not only sewage but possibly sediment effects, mixing of fresh and salt water, land movement in new housing areas, the age and condition of plants in such inner parts of the estuary, and many other factors" [10].

12. LONG TERM POLICY ON DIRECT DISCHARGES INTO CORK HARBOUR

The Water Pollution Advisory Council stated that it regarded water pollution as an environmental problem. "Over a ten year period to 1981 there has been a virtual doubling of the proportion of river channel affected by slight or moderate pollution. In the urbanised reaches of some of our estuaries and coastal waters, there is serious localised pollution, caused by the discharge of untreated wastes through numerous outfalls".

There is no policy on the long-term effects the present levels of effluent going into Cork harbour might have, and any attempt in the past ten years to create an infrastructure where scientists from University College, Cork (UCC), for example, could monitor on a continuous basis has been discouraged, either through procrastination on the part of the local authority or central government. When the pharmaceutical/chemical companies have been approached to fund such studies they have demanded unreasonable preconditions. Yet several scientists believe that the pharmaceutical/chemical industry should contribute to a central fund which would then distribute to projects on environmental control [11].

13. LEGISLATION GOVERNING SEA DUMPING

The regulation and monitoring of dumping at sea is entrusted to the Department of the Marine by means of the Dumping at Sea Act, 1981. Similarly to the Local Government (Water Pollution) Act, 1977, the Dumping at Sea Act, 1981 grants licences to dump. The criteria are described in the Act with respect to the Annexes of the London Dumping Convention and the Oslo Convention. These Annexes of these international conventions refer to characteristics and composition of the matter dumped, characteristics of dumping site and methods of deposit and a section on general considerations including the effect the matter would have on the marine environment. The Act states "the Minister shall cause to be established and kept a register and shall cause to be entered in the register particulars of all permits granted under this section". The copies of permits available to the public are totally rudimentary in terms of information. For example, "waste derived from the manufacture of organic chemicals" is the only information available to the public concerning the 1.3 million tonnes of waste dumped by the Pfizer Chemical Corporation.

The Act calls for "an authorised officer ... to monitor the effects of any dumping". As one would expect, having reviewed the Local Government (Water Pollution) Act, 1977 the type, frequency and methodology of monitoring is not specified and all information is withheld from public scrutiny.

In connection with the two companies dumping at sea off Cork we shall refer to Table I, Part I, section C/4 of the Dumping at Sea Act, 1981 which states "The practical availability of alternative land-based methods of treatment, disposal or elimination, or of treatment to render the matter less harmful for dumping at sea". Also from the same Act and Table we will refer to section B/9 "in issuing a permit for dumping. Contracting Parties should consider whether an adequate scientific basis exists for assessing the consequences of such dumping, as outlined in this Annex, taking into account seasonal variations".

13.1. Pfizer Chemical Corporation

The Pfizer Chemical Corporation is licensed to dump 1.3 million tonnes of organic waste annually making this the largest sea dump operation in the North East Atlantic. The total BOD load of Pfizer's effluent presuming the maximum output considered in 1977 is "equivalent to the total BOD load of the whole of the Republic of Ireland. It is therefore a major environmental problem" [6]. The effluent is essentially non-toxic and the company operates "in full compliance with the terms of its licence and its compliance is monitored by the Department of the Marine" [12]. However, none of the monitoring data is made available to public scrutiny and we would refer to the CII/An Taisce (see pp. 28-29) report recommending more openness by government and industry in these matters. At a recent meeting between Greenpeace officials and the Department of the Marine, the Minister, Mr Brendan Daly TD, laughed when asked for monitoring details of the Pfizer sea dump operation. It was, he said, "strictly confidential information".

More importantly, and in the context of the Irish Government's wish to be involved with the North Sea Conference Declarations, the Pfizer sea dump operation contravenes both the spirit of the precautionary principle and the North Sea States acceptance as matters of principle that "As from 1st January 1989, no material shall be dumped in the North Sea unless there are no practical alternatives on land" [13]. Also we would refer to the decisions to employ the Best Available Technology (BAT) for disposal of wastes.

The internal Pfizer report referred to earlier [6] mentions alternative methods of production employed by Pfizer at its plants in Groton and Southport, Connecticut, USA in the production of citric acid. "The scheme proposed for sea dumping is substantially cheaper both in terms of capital investment and annual running costs than the Citcon process such as it is used at Groton and the Weston bio-oxidation process that is used at Southport".

According to figures in the internal report, the Citcon process would produce approximately half the effluent of the present process and produce a saleable by-product but Pfizer felt "we already dispose of the Ringaskiddy effluent by sea and the management time and effort taken to expand the scheme is minimal compared to the major disruption that would occur if we completely changed to another process" [6].

Information obtained by Greenpeace in the USA states that the products of the Citcon process are:

(1) A 'spent broth' concentrate which is similar to molasses in consistency and odor (sic). This concentrate is used as a food supplement or extender for feeding to cattle and horses.

(2) An aqueous waste-stream which has a biochemical oxygen demand that is only 4-5% of the BOD of the untreated spent broth, i.e. BOD removals in excess of 90% are readily achieved with the Citcon process.

Greenpeace would like to know whether the relevant Minister (in accordance with Table I, Section C/4 of The Dumping at Sea Act, 1981) requested information from Pfizer as to "the practical availability of alternative land-based methods of treatment, disposal elimination, or of treatment to render the matter less harmful for dumping at sea".

Pfizer's internal report generally concerns itself with a waste policy that is convenient to the company and portrays a cynicism to the environment and the regulatory authorities. "Irish law tends to be non-specific in effluent matters, reflecting the unadvanced state of the economy" and "as a tactical matter we shall try to persuade the Minister to delay repeal of s. 171 of the Fisheries Act until the new dumping at sea licensing system has been introduced. We should then be an 'existing discharger' for the purpose of any special or transitional arrangements in the new legislation for current discharges" [6].

13.2. Irish Refining Company Plc

This company was formerly owned by a consortium of Shell, BP, Texaco and Esso and was bought by the Irish Government in 1982 so as to enable the Government to have access to its own petroleum supplies. The company at present is operating at roughly 50% capacity, refining 1.25 million gallons of crude oil into various petroleum products.

The refinery is licensed by Cork County Council to discharge process water, sanitary effluent and ballast water, after being directed through skimming tanks into the outer harbour.

The company is also licensed by the Department of the Marine to dump approximately 6,000 tonnes of caustic soda in the same area as used by the Pfizer Chemical Corporation. Caustic soda, as used by oil refineries is contaminated with polynuclear aromatics and other hydrocarbons and is therefore a toxic threat to the marine environment.

Greenpeace has contacted other oil refineries and discovered that there is nowadays no reason to use the sea dump option of disposing of this waste. Other companies employ proprietary processes such as 'meroxing' whereby mercaptans are removed from the product being treated by means of a recirculating liquid catalyst. The caustic is then regenerated with air to convert the mercaptides to disulphides which are removed and the catalyst re-used. In other words, technology has evolved a regenerative process which allows the caustic soda to be re-injected into the distillation unit and avoid the need for creating waste.

14. CONFEDERATION OF IRISH INDUSTRY (CII) - AN TAISCE REPORT

"There is concern among industry and environmental groups that some local authorities do not have access to the expertise to deal with the technical complexities of large scale industrial projects, or for that matter with small scale developments based on new technology". These comments, taken from a joint CII/An Taisce study [14] on industry and the environment published in April 1988, do not apply entirely to Cork County Council yet there is no indication in the study that they are exempt from criticism.

"Although the co-ordination and the quality of control has improved industry and An Taisce still have reservations about the key role of local authorities in enforcement. Industry believes that the present standard of licence conditions for older firms may be too harsh, and in certain cases industry would favour a graded system where effluents would have to be improved in stages over a stated time. Although the standards set can be high, enforcement is weak. A detailed list of conditions may strike industry as rather pointless when there is no follow up to check compliance. Industry generally adheres to the standards set, but they would find the rules easier to accept if matched with a proper interest in compliance. Conditions, licences and permits are only as good as enforcement. Local authorities appeared in the past to give enforcements a low priority. More effective control would not only prevent unauthorised developments, but it would also prove that most industries are clean and offenders would stand out as the exception".

"In practice enforcement procedures are rarely set in motion. This is not due to lack of inspectors, but because problems, when they arise, are often solved through discussion. Where discussion fails and procedures are initiated the legislation appears inadequate. In An Taisce's view, however, activation of enforcement procedures is slow, court adjournments are frequent and fines are too low. Industry, however, takes the view that the purpose of the exercise is to stop pollution, so if discussions produce the best results then penalties should only be used as a last resort".

Much of An Taisce's comments, in this regard, do apply to the pharmaceutical and chemical industry in Cork harbour. Iain Maclean has confirmed that if there is a problem with one of the plants he or one of his inspectors is quick to sort it out by talking to the offenders [6]. Yet An Taisce is not specific when it stresses that the monitoring of effluent is inadequate.

An Taisce is also concerned about the relationship between industry, authorities and the public and is particularly critical. "An Taisce believes that government departments and local authorities should provide full information and encourage public participation. This does not happen, and indeed the reverse is often true. Unemployment and slow industrial growth have created a climate where there can be a fear of disclosure lest job prospects are put at risk. In a bid to please industry local authorities and the government can seek to minimise consultation lest there are conflicts leading to delays and extra costs. This attitude must change, and planning procedures should

be open. Secrecy, if demanded, should be an exception, and a plea for confidentiality may not be used as a device to hide environmentally sensitive information".

Recommendations by An Taisce include the "involvement of the public in monitoring of effluent through the provision of information and effluent sampling for bone fide inquiries. The results of monitoring should be made available for inspection by everyone. In 1986 the Department of the Environment requested that this should be done and the results made available on a national level to such bodies as An Foras Forbartha". This has not been done and An Foras Forbartha is presently being reconstituted.

15. INDUSTRY AND PUBLIC INFORMATION

In September 1985 an independent body, the Sectoral Development Committee (SDC), comprising civil servants, representatives of governmental bodies and trade unionists, published a report on the chemical and pharmaceutical industry in Ireland [15].

Of particular interest are the section on 'Environment for Development' and 'Legislation and Control'. "There is at times a tendency on the part of sections of the public to react negatively to proposals for establishing chemical plants in particular locations even where the likelihood of any environmental or health hazards is negligible" states the report under the heading 'Public Information Programme'.

"The solution to the problem", it continues, "lies in open discussion and the widespread dissemination of relevant information. For this reason the Federation of Irish Chemical Industries (FICI), in consultation with the Department of the Environment, the Dangerous Substances Advisory Council and the Health Education Bureau, should undertake a public information and awareness programme to give the general public a better appreciation of the need for and benefit of chemicals and the chemicals industry and the measures available to and taken by the industry to protect consumers, the public and the environment from the potential hazards of the industry".

Under the heading 'Planning Permission' the report expresses concern that delays in obtaining planning permission for "certain industrial projects" due to objections "have been a cause of concern". While acknowledging that there has been an improvement and that An Bord Pleanála has dealt "quickly and expeditiously with appeals - particularly those which have important employment creation implications" the independent body urges the State planning body to "maintain their efforts to deal quickly and fairly with planning applications at the appeal stage so that the costs involved for new industrial projects are ultimately acceptable from an environment stand-point are minimised".

In 1980 Gaeleo managing director Noel Murphy said that the reason why his company sited in Little Island in Cork harbour was because "we wanted a place with a similar infrastructure to the home country without so many government restrictions" [3]. Ireland, therefore, is seen by chemical and pharmaceutical companies "as a good country to do business in" and there is praise for "the sympathetic business minded attitudes by central government and local authorities" [3].

It is clear that the economic considerations, dictated by governmental policy, are paramount. "I don't think you can divorce the economic argument from the environment" Iain Maclean said when asked why the local authority did not place a greater emphasis on pollution control [4]. There are, however, several examples which show that "the state's approach to environmental issues is heavily biased in favour of industry. Legitimate public fears are treated as an obstacle, to be overcome by propaganda, official sleight of hand, or bureaucratic stonewalling" [16].

Despite the good intentions of the SDC there is nothing like a "public information programme" in Ireland and any attempt by a concerned member of the public to obtain "relevant information" is frustrated by bureaucratic red tape. Details of a chemical or pharmaceutical company's planning application and licence, under the 1977 Water Pollution Act, to discharge effluent are only available during office hours at the local authority's building. Photocopies of the same information may be obtained but the local authority charges £5 per copy.

Iain Maclean has said that the environment "is a matter of public opinion - we're trying to police the operations (of these plants) and I think we do it to a satisfactory degree, to accepted standards. We won't go out of our way to change the standards, that is where public opinion comes into play and I would hope that it is informed opinion" [4].

Maclean adds that "we could be damaging the environment" but stresses that any argument must be put into perspective. Where Cork harbour is concerned that perspective is politics, politics which determine that jobs in the short term are the significant factor. The fact that the indirect affect of providing those jobs may be detrimental to the environment must, according to government policy, be secondary. And despite the public's growing awareness the long term effects that industrial, domestic and agricultural effluent will have on the water quality and marine life in Cork harbour are not being considered.

A report prepared for the Minister for the Environment in 1985 and published by An Foras Forbartha places these contradictions in political perspective. Referring to how modern economic growth has resulted in "new products which are often not capable of being broken down by natural processes and have poorly understood long-term health and other impacts" the report states that "this same economic growth has given large numbers of people, through education, both the opportunity and the ability to understand and appreciate nature and natural processes: and there has been a resultant demand for improved living conditions and a good quality environment" [17].

"Our planners and policy makers are now required not only to use available tools to generate growth but also to regulate its impact on the environment. Economic growth should, however, enhance the ability of society to conserve the environment by increasing expenditure from the expanding wealth created" [17].

16. CONCLUSIONS

Greenpeace demands that the Irish Government re-evaluate its policies regarding water pollution caused by direct discharges of sewage and trade effluent to rivers and estuaries and by sea dumping of industrial waste.

In view of the Irish Government's stated commitment to the precautionary principle, as adopted by the North Sea States, Greenpeace demands that:

(1) as from 1st January 1989 no material shall be dumped in the Irish Sea unless there are no practical alternatives on land and it can be shown to the competent international organisations that the materials pose no risk to the marine environment;

(2) reduce the discharge of toxic, persistent or bio-accumulative materials into the Irish Sea by 50% by 1995.

Greenpeace demands that the Irish Government make available, upon request, to the public and interested bodies and organisations all environmental impact assessments and monitoring data.

Greenpeace demands that the Irish Government, as a matter of urgency, initiate research into no-waste/low-waste technologies and insist that industry use the 'best available technology' (BAT) in an effort to prevent the generation of waste.

Table 2. Companies discharging into Cork harbour.

Cara Partners Ltd

Address: Little Island
 Workforce: 85
 Parent Companies: Dr William Schwabe Gmbh & Co., Karlsruhe, FRG
 (Holding company for group involved in production of pharmaceuticals, plant extracts, tinctures & natural products. Workforce 938).
 Laboratoires Beaufour SA, Dreux, France
 Products: Pharmaceutical fine chemicals
 Discharges: Ammonia, Acetone, Butanone, Ethanol, and Trichlorethylene.

FMC (Ireland) Limited

Address: Little Island
 Workforce: 70
 Parent Company: FMC Corp., Pennsylvania, USA
 No. 137 in Fortune 500
 Assets \$2595.1 Million. Sales \$3139.1 Million
 Profits \$180.5 Million
 Products: Chemicals and Machinery for Industry, Agriculture and Government.
 Has 89 manufacturing plants and mines in 25 US states and 14 other countries.
 Products: Microcrystalline cellulose;
 Chemicals for Pharmaceuticals;
 Base compounds for pills and tablets
 Investment: \$10,000,000
 Market: Europe
 Discharges: Heavy Metals.

Preliminary sitework began in September 1976. Received no grant-aid from IDA due to high capital/low job nature. Entitled to training grants.

Company withdrew appeal against a number of conditions attached to its planning permission in summer 1976.

Gaeleo

Address: Little Island
 Workforce: 55
 Parent Company: Pharmacia, Sweden.
 No. 874 in Business Week Global 1000.
 Market value \$1.59 B. Sales \$1021 M.
 Profits \$111 M. Assets \$1150 M.
 Products: Fine Chemicals/Pharmaceutical Intermediates;
 Also has process development unit (IDA-aided) to carry out process design and new product development.
 Market: USA (mainly)
 Discharges: Ammonia, Phenols, Heavy Metals, Pyridine.

Established 1973. Major new expansion promised in January 1988, mainly capital-intensive though with some additions to labour force.

Glanmire Industries Limited

Address: Glanmire
Workforce: 75
Parent Company: Punch & Co. Limited, Cork, Ireland
Products: Aerosol filling service
Pressurised container filling service
Polishes; Detergents; Cleaners;
Bleaching Agents; Dyes; Paints; Primers;
Lacquers
Market: Export
Discharges: Ammonia

Henkel Ireland Limited

Address: Little Island
Workforce: 80
Parent Company: Henkel Kgaa, Dusseldorf, Germany
Products: Chemicals, Industrial Adhesives,
Hygiene & Industrial Chemicals, Cosmetics,
Toiletries.
Profit 292,000,000 DM.
Products: Mining & Industrial Chemicals including ion-
exchange reagents and chemically active
ingredients; detergent additives, proteins,
and enzymes; Vitamin E.
Investment: £2.4 M (Irish) invested in June 1984 to
increase production of ion-exchange reagents
(IDA-grant aided).
Discharges: Phenol, Cyanide, Heavy Metals.

Irish Fher Laboratories

Address: Little Island
Workforce: 46
Parent Company: C.H. Boehringer & Sohne, FRG
(through Boehringer Ingleheim GmbH, major
German pharmaceutical company - 4th largest
in 1976).
Products: Fine Chemicals/Pharmaceutical Intermediates.
Investment: £3,000,000 (Irish).
Discharges: Phenol, Manganese.

Production began in May 1976. Announced major expansion in June 1984 which would result in doubling of output by 1988. Also set up product and process development unit (IDA aided).

Janssen Pharmaceutical Ltd

Address: Little Island
Workforce: 52
Parent Company: Johnson & Johnson, USA
No. 74 in Business Week Global 1000
Market value £13.42 B. Sales \$8012 M.
Profits \$833 M. Assets \$6546 M.
Products: Pharmaceutical Intermediates;
Biocides.
Market: Europe mainly. Japan (minor),
Discharges: Ammonia, Phenols, Heavy Metals.

Company took over existing Pilmar Pharmaceuticals Ltd plant in August 1981 to commence production in September 1981 and to increase workforce from 23 to 85.

Mitsui Denman (Ireland) Ltd

Address: Little Island
Workforce: 120
Parent Company: Mitsui Mining & Smelting Co., Japan
(Eventual parent company is Mitsui & Co., Japan.
No. 130 in Business Week Global 1000.
Market value \$9.03 B. Sales \$113299 M.
Profits \$122 M. Assets \$41471 M.
Products: Electrolytic Manganese Dioxide,
Also operates testing lab for organics with special emphasis on heavy metal analysis in solid and liquid samples
Investment: Original investment of £6,000,000 (Irish)
Overall capital investment of £11.2 M
IDA holds 5% of company's equity which was valued at £440,000 (Irish) in August 1983.
Market: EEC
Discharges: Arsenic, Manganese and other Heavy Metals.

County Council official flown to Japan to see company's Takehara plant and to discuss the plant with Japanese environmental authorities. Company announced in September 1973 it would spend £1,000,000 (Irish) on pollution control.

Raw material imported from Ghana.

Plaistow Ltd

Address: Little Island
Workforce: 35
Parent Company: Plaistow Ltd, Switzerland
Products: Pharmaceutical Fine Chemicals.
Also involved in custom synthesis and research and development.
Discharges: Phenols, Cyanide, Pyridine.

30 August 1982: Two dockers exposed to highly toxic dimethyl sulphate (DMS) on ship in Cork Harbour taken to hospital for treatment. DMS being shipped to Plaistow. Plaistow refused to discuss incident with Sunday Tribune.

19 September 1988: Two workers burnt, one badly, in fire at company's plant. Believed caused by ignition of oxyprozene which was being mixed at high temperature. Cork Fire Brigade source criticised company for failing to inform them of fire. Company refused to give Cork Examiner details of incident and refused photographer access to plant.

Wexport Limited

Address: Little Island
Workforce: 15
Parent Company: Leo Laboratories of Denmark
Products: Chemical Synthesis Plant
Discharges: Ammonia

Set up in November 1986. Came on stream a year later.

Yates Industries (Ire) Limited

Address: Little Island
Workforce: 84
Parent Company: Square D, Palatine, Illinois, USA
Products: Electrical and Electronics
Finished copper foil for electronics ind.;
Raw material; Scrap copper
Discharges: Heavy Metals.

Established 1978. Received £1.37 m in grants from IDA.

Irish Fertilisers Industries Limited

Address: Marino Point
Workforce: 1,000 (in all Ireland)
Parent Company: Nitrigin Eireann Teoranta - 51%
ICI (Richardson's Fertilisers Ltd) - 49%
Sales: £140,000,000 (Irish)
Discharges: Over 1,000 tonnes Ammonia per year

Originally known as NET. Now IFI. As NET company received £5,575,000 (Irish) in new industry grants from IDA up to 31 Dec 1977. Original estimate for construction of Marino Point plant £35 M punt, eventually cost £135 M.

Late June 1979: bus carrying 60 schoolchildren drove into ammonia gas leak from plant. Local vegetation defoliated.

29 June 1979: Another leak.

30 August 1979: Fire in natural gas unit led to immediate shutdown of plant. No injuries.

16 May 1980: Cloud of ammonia from plant drifted over Cork city and suburbs. Residents suffered eye, nose and throat irritation. 13 tonnes of ammonia release in two leaks. Concentrations of 10 ppm in air found by NET officials in several parts of Cork city.

August 1980: In proceedings in the High Court, Cork County Secretary blamed NET's failure to fulfill 3 of the 35 planning conditions laid down in 1975 for the leak.

23 May 1980: Ammonia leak, residents in Cobh, Passage West and Glenbrook complain of high levels of ammonia in the air.

10 January 1981: Emergency shutdown following 'operating upset'. Charles Hennessy, chairperson of Passage West Town Commission said at least six such incidents had previously occurred. NET denied covering up danger.

6 October 1981: Fire in pressure vessel. Fortunately plant was out of commission for overhaul so there was no ammonia emissions.

22 November 1982: Trip out releasing steam (according to NET) or ammonia (according to nearby residents) led to emergency shutdown of plant.

4 & 5 December 1982: NET denies local residents' reports of exposure to ammonia over weekend.

1 September 1983: Residents allege 'suffocating smell of ammonia' NET denies any problems.

23 March 1985: Family evacuated. Cobh/Cork road shut in emergency response to ammonia leak.

3 April 1985: Leak while ammonia being loaded for trans-shipment to Arklow.

23 October 1985: NET announces installation of alarms in Passage West to warn residents of ammonia leaks (under Seveso Directive).

Angus Fine Chemicals Limited

Address: Ringaskiddy
Workforce: 150
Parent Companies: Angus Chemical Co., Chicago, USA
Isochem SA, Paris, France
Products: Fine chemicals/Pharmaceutical intermediates.
Calcium, Compounds for Agriculture;
Potassium and Sammonium compounds;
Organic chemicals; Organo-Metallic compounds;
Packaging & Filling for Pharmaceuticals;
Also R&D of new products;
Manufactures Aspartame artificial sweetener.
Investment: £12,000,000 Punts
Jobs Target: 250
Discharges: Phenols, Cyanide, Heavy Metals.

Originally plant was intended for Wales. April 1984 company applied for planning permission in both Wales and Cork. Planning permission given 18 July 1984 after An Bord Pleanala rejected appeal by one person living near plant. Suggestion made at press conference (24 July 1984) that several IDA officials had visited home of this objector. First sod on-site turned 30 July 1984.

Company does not normally have trade union involvement in their factories.

Financial Times reported, 25 July 1984, decision to locate in Cork was due to less stringent effluent discharge standards. Company had claimed effluent treatment facilities at the site in Wales would have added £1,000,000 (Sterling) to cost.

Pfizer Chemical Corporation

Address: Ringaskiddy
Workforce: 590
Parent Company: Pfizer Inc., New York, USA
No. 137 in Business Week Global 1000.
Market value \$8.62 B. Sales \$4920 M.
Profits \$690 M. Assets \$6923 M.
Products: Bulk Pharmaceuticals including Randomycin and Vibramycin (antibiotics), Feldene (non steroid anti-inflammatory) and anti-hypersensitivity drug.
Also bulk Chemicals:
Citric Acid; Calcium Citrate; Sodium Citrate;
Potassium Citrate; Sodium Gluconate;
Glucono Delta Lactose; Gluconic Acid.
Citric Acid plant has 50 M lbs capacity.
Discharges: Magnesium, Ammonia and other Heavy Metals.
Established: 1969.

Recieved £7,266,000 (Irish) in new industry grants from IDA up to 31 December 1977. Overall investment over £80 M.

Annual wage bill (620 workers, January 1983) £7 M.

Involved in 4-day public hearing of appeal against planning permission in October 1972 re effluent. Threatened it would look for alternative site outside of Ireland.

Feldene recently came under strong attack from Health Research Group (Ralph Nader affiliated) in US.

Irish Refining Co.

Address: Whitegate
Workforce: 155
Parent Company: Irish Government
Products: Petroleum products
Discharges: Heavy Metals.

1980: Two accidents: One at jetty, one in which worker's leg was burnt.

4 February 1981: Worker killed by explosion caused by vapour flash (presumed to be hydrogen vapour) during routine sampling of a 1.2 million gallon tank of diesel oil.

Penn Chemicals (BV) (Ireland) Ltd

Address: Carrigaline
Workforce: 250
Parent Company: Smith Kline Beckman, USA
No. 182 in Business Week Global 1000
Market value \$6.66 B. Sales \$4329 M.
Profits \$570 M. Assets \$4222 M.
Products: Pharmaceutical Fine Chemicals,
Produces Cimetidine, Anti-ulcer drug marketed as Tagamet.
Also produces 5 chemical intermediates formed in manufacture of Tagamet.
Market: Britain, Germany, France, Japan.
Investment: £3,000,000 (Irish).
Discharges: Phenols, Cyanide, Ammonia.
Opened July 1975.

Spends 20% of operating costs on environmental control. Spent several million Irish pounds on monitoring and incineration equipment to deal with mercaptan odours.

14 August 1983: One worker injured by flying glass from explosion in glass-line which carries waste gases from plant to incinerator area. Accident resulted in automatic shutdown of plant.

Table 3. Biological Oxygen Demand (BOD).

Biological oxygen demand (BOD) is a "test widely used to determine the pollution strength of an organic waste in terms of the amount of dissolved oxygen consumed by microbial and chemical action when a sample is incubated under specific conditions, usually for 5 days at 20 C. It is usually expressed as milligrams of oxygen consumed per litre of sample. Its significance is that it gives an indication of the extent to which the oxygen content of receiving water may be depleted by the waste" [18].

Although BOD is used as a parameter to monitor the effluent, the amount of BOD a receiving water can take is determined by the population. In industry it works out at 50/60g per head, although it may vary with the sophistication of the population. The population of Cork is approximately 136,000.

17. REFERENCES

1. Ireland - An Investment Opportunity for the Pharmaceutical Industry. SCRIP 1985. PJB Publications Ltd, 19-20 Hill Rise, Richmond, Surrey, UK.
2. Industrial Development in Ireland. Desmond O'Malley TD. pp. 875-8, Chemistry and Industry. 15th November 1980.
3. Eire's CHEMical Industry. Sandra Heathcote. pp. 872-4, Chemistry and Industry. 15th November 1980.
4. Iain Maclean, Chief Environmental Officer, Cork County Council. Interview with Robert Allen, Magill.
5. The Law and Practice Relating to Pollution Control in Ireland. Yvonne Scannel (for Environmental Resources Ltd). Graham & Trotman Ltd (for the Commission of the European Communities) 1976, pp. 31-33.
6. Pfizer Europe, Inter Office Memo, March 21, 1297. Ringaskiddy Effluent Study.
7. (a) IIRS Report. (b) M.C. O'Sullivan Report.
8. Estuarine and Marine Coastal Pollution in the Republic of Ireland. Alan Myers. Marine Pollution Bulletin, Vol. 12, No. 8, pp. 260-264, 1981. Pergamon Press.
9. Pathobiology of Fish in Cork Harbour. Catherine Maye. Unpublished thesis, Department of Zoology, University College, Cork. November 1986.
10. Uses of Seaweed as Biomonitors of Zinc Levels in Cork Harbour, Ireland. J.P. Cullinane, T.M. Doyle & P.M. Whelan. Department of Plant Science, University College, Cork. Hydrobiologia 151/152, pp. 285-290, 1987, Dr W. Junk Publishers, Dordrecht, The Netherlands.
11. Alan Myers, Department of Zoology, University College, Cork. Interview with Robert Allen, Magill.
12. Pfizer Chemical Corporation, Cork. Press statement, 11th November 1987.
13. Guidance Note on the Ministerial Declaration, Second International Conference on the Protection of the North Sea. UK Department of the Environment, February, 1988.
14. Joint CII/An Taisce study on Industry and the Environment. April 1988. Government Publications Sales Office, Molesworth Street, Dublin 2.
15. Sectoral Development Committee. Report and Recommendations on the Pharmaceuticals and Chemicals Industry, 1985. Government Publications Sales Office, Molesworth Street, Dublin 2.
16. Kieran Keohane, Thesis, Dependent Industrialisation, Crisis Transfer and Displacement: The Transnational Pharmaceuticals Industry and the Irish Republic, March 1987. Department of Social Theory and Institutions, University College, Cork.
17. The State of the Environment. An Foras Forbartha. 1985.
18. Coastal Pollution Assessment Seminar, April 20/21, 1978, Silver Springs Hotel, Cork. Published by the National Board for Science and Technology, 1978.

