

The Economic Assessment of the Proposal for a Directive on the Prevention and Restoration of Significant Environmental Damage

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Executive Summary

There are today in the Community many contaminated sites posing significant health risks and the loss of bio-diversity has dramatically accelerated over the last decades. The current situation is most likely due to the absence of comprehensive and consistent liability rules for environmental damage in the Community. Action by Member States has so far been insufficient to solve the problem.

The problem at hand is of Community significance and lack of Community action would possibly result in the continuation of this negative environmental trend or in a patchy legal framework across the Community likely to hinder the free movement of goods and services within the internal market and of creating market inefficiencies. Moreover, no Member State has so far instituted on its own comprehensive liability schemes for damage to natural resources as such. This proposal aims at changing this situation in the future by creating liability for damage caused after its entry in force.

All the alternatives considered to address the problem relied on the use of liability rules. As a matter of fact, liability has no real substitutes. Rather it is a necessary complement of regulation and economic instruments. All should be used consistently.

This assessment of the proposal focuses on costs because it is not possible to quantify the benefits of the proposal. Nevertheless they are expected to be very significant. Health-protecting, welfare-enhancing and cost-effective restoration of environmental damage is the more visible expected benefit from this proposal but perhaps more importantly it should lead flexibly to more efficient prevention levels.

That only costs are quantified and thus visible should not cloud judgement as to the merits of the proposal. Doing nothing is unsustainable since the costs would possibly be higher (more contamination, less bio-diversity) and the benefits associated with more efficient levels of prevention, with the corresponding net saving of economic resources, would be lost.

The assessment addresses all the major economic issues raised by Community environmental liability: the effect of liability on prevention, the financial assurance of liabilities, the assessment of natural resource damage and the costs of the draft directive, including its distribution by economic actors and its impact on industry competitiveness. The findings of all the major studies undertaken in the context of the preparatory work of this proposal are critically reviewed and presented here. Links to the actual studies are provided.

The effect on prevention

Liability provides incentives for efficient levels of prevention thus helping to avoid damage. However, these incentives can be counteracted by perverse substitution effects. These happen when companies spin-off risky activities to thinly capitalised and poorly operated subsidiaries or contractors, substitute air emissions for soil emissions (soil emissions are more likely to give rise to liability than air emissions) or de-localise emissions to places where liability is less stringent.

A study (<http://www.europa.eu.int/comm/environment/liability/preventive.htm>) was conducted on the possible presence of these substitution effects in the U.S. context. In that country, environmental liability rules have been in place for many years and vary somewhat amongst States, allowing for the construction of quantitative models. The interim findings of the study, though not entirely satisfactory due to insufficient and/or low quality data, are at least reassuring in the sense they indicate that to the extent that liability is leading to lower emissions, there is little if any undesirable substitution going on. In other words, we looked for evidence that liability was not working as intended and found none.

The financial assurance of environmental liabilities

The effectiveness of liability in changing attitudes towards preventative behaviour, and ensuring appropriate restoration of environmental damage, depends to a large extent of whether potential damage is financially assured or not.

The challenges associated with, and the feasibility of, financial assurance for liabilities arising under the proposal were explored. In other words, we investigated whether the liabilities created by the proposal can be financially assured and also whether similar liabilities have actually been assured.

Two different studies were conducted in this area, one on the general issues (http://www.europa.eu.int/comm/environment/liability/insurance_gen.htm) and the other on the issues associated with U.S. natural resource damage liability (http://www.europa.eu.int/comm/environment/liability/insurance_us.htm).

The findings can be summarised as follows:

- Minimising the social costs with pollution can only be achieved if liability and environmental protection regulation are used consistently and efficiently, as complements rather than substitutes. Setting up a liability net does not dispense regulators from keeping an efficient system of environment protection regulations and norms.
- Most likely, the liability imposed on operators by the proposal can be financially assured, notably through insurance. This includes liability for natural resources damage (NRD). Insurance in the Community may prove more difficult to get and/or more expensive than in the U.S., given that, unlike the draft directive, the U.S. statutes exclude from liability damage caused by federally permitted releases and provide other potentially significant exemptions. However, insurability will be easier than in the U.S.¹ in the Member States that will opt for proportional liability (the U.S. applies joint and several liability).
- In contrast to U.S. liability, the proposal imposes unlimited liability. This may make insurability more difficult and/or more expensive (at least until insurers build up sufficient experience with the regime), particularly in the Member States that would opt for a joint and several liability standard.
- In the absence of mandatory financial assurance for operators, it is unlikely that the latter will seek to insure voluntarily to any significant extent their potential liabilities. However, as said before, it is quite likely that the liabilities can be insured.

¹ All else the same.

- There are several ways of providing financial assurance but insurance cover is likely to be, by large, the most significant one.

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The assessment of natural resource damage

Natural resource damages remain controversial and difficult to value. The approach retained favours restoration over monetary measures largely because restoration costs are easier to estimate, rely on fewer untested economic valuation methodologies, and are verifiable ex post. The proposal also gives an explicit preference to the least cost option amongst alternatives likely to deliver similar environmental benefits. The option retained in the proposal was developed on the basis of a study commissioned on the valuation and restoration of damage to natural resources (<http://www.europa.eu.int/comm/environment/liability/biodiversity.htm>) and is similar to the approach that has been effectively used under the U.S. Oil Pollution Act 1990² (for a summary of this approach see http://www.europa.eu.int/comm/environment/liability/tp_enveco.pdf).

Potential costs with the draft directive

Cost data on Member States' contaminated sites programs are patchy and shallow. The existing cleanup regimes in Member States are fairly different. Moreover Member States do not have to any significant extent liability for damage to natural resources as such. Hence, existing Member States environmental liability regimes were not a suitable base case for the cost impact assessment of the draft directive. The U.S. Comprehensive Environmental Response, Compensation, and Liability Act 1980³ (CERCLA, also known as "Superfund") provided instead the base case, since it is sufficiently similar with the proposal, has been in operation for more than 20 years and there is a relative abundance of cost data on its implementation.

This is not to say that CERCLA and the proposal are equivalent programs. There are some key differences between CERCLA and the proposal with significant impacts on costs. The differences and their potential cost impacts were identified and discussed, quantitatively where possible, qualitatively otherwise. A comprehensive analysis of CERCLA was commissioned and is available in <http://www.europa.eu.int/comm/environment/liability/comp.htm>⁴.

CERCLA is a fully retrospective program, i.e., it (also) creates liability for wastes legally disposed of before its entry in force. For the purposes of this analysis and since the proposal is not meant to be retrospective, CERCLA was stripped off its retrospectiveness, i.e., only the costs associated with the cleanup of sites contaminated by wastes disposed of after the entry in force of the program were considered.

CERCLA is a federal program, but there are also similar programs at (U.S.) State level. For the purposes of this assessment, whenever possible the sum of the costs of the (federal) CERCLA and the costs of the States' programs has been considered,

² 33 U.S.C. 40.

³ 42 U.S.C. 103.

⁴ Further details are available from <http://www.rff.org/books/descriptions/probst.htm>. The most recent cost data can be found in http://www.rff.org/proj_summaries/00files/probst_cost_superfund.htm

since the proposal should apply to sites and damage of national and Community relevance.

On this basis, the rough magnitude of the annual costs associated with the proposal would be as in the following table⁵, *abstracting from all the differences between CERCLA and the proposal but retrospectiveness (on retrospectiveness some qualifications are discussed below)*. These costs are to be interpreted as orders of magnitude with wide margins of uncertainty, but remain nevertheless the best partial estimate available.

Baseline Annual Costs of the proposal (million €, 2000 prices)			
Cleanup Competent Authorities (CA)		300-400	Depending on weight of Member States-level damage
Cleanup Private Parties (PP)		540	No allowance made for State-level liability
Total cleanup		840-940	See above CA
Bio-diversity damage		60-70	See above CA
Transaction costs, PP		140	
Administrative Costs CA		350	
Total costs		1400-1500	

The costs above are only baseline costs and they are partial costs (the actual costs will be different depending of the actual impact of the qualifications discussed below. It was not possible to quantify these other impacts). They correspond roughly to 1/3 of the annual costs with the (retrospective) U.S. Federal and States' Superfunds (the other 2/3 correspond to the retrospective impact of Superfund).

The costs may look high, but they would not disappear in the absence of Community liability legislation. These are real costs materialised in environmental damage that would still happen without liability. If anything, social costs would be higher without a proper liability regime, given the absence of efficient incentives towards prevention. The total cost above should be below 1.5% of the total expenditure in the Community with environmental protection, i.e. below 0.02% of gross domestic product (GDP). And as a measure of the personal effort required, it is enlightening to consider that the cost per person is lower than 4€ (3€ if the population of the 12 Candidate Countries is factored in).

However, these findings are based on the assumption that the proposal will not be retrospective. In practice though the proposal may indeed apply to wastes disposed of legally before the entry in force of the new directive. What the directive states in this regard is that it will not apply to damage *the cause of which* occurred before its entry in force. Therefore, whether or not it will be retrospective (in the sense that it would apply to wastes disposed of before the date of implementation) depends of whether the cause of the damage will be interpreted as the disposal of waste or as the release

⁵ After correcting for differences in GDP between the Community and the U.S. and on the basis of an exchange rate of 1€=0.9 USD. The GDP of the accession countries is factored in but this does not change significantly the conclusions.

of the hazardous substance⁶. Were the latter interpretation to prevail the costs of the proposal program will rise and become a larger share of Superfund's than is assumed above.

There are five other significant differences between Superfund and the proposed approach which are likely to have significant cost impacts that will change the baseline figures given above though there is no way of knowing by how much.

First, Superfund does not mandate the cleanup of contamination caused by permitted releases of hazardous substances. It does not cover instances of possible contamination that were identified in legally required environmental impact statements nor does it apply to damage caused by legally registered pesticides. The proposal has no comparable exemptions. This implies higher costs for our directive than Superfund's.

Second, while Superfund only covers damage caused by releases of hazardous substances, the proposal goes further by covering also damage related to activities in general, noise, heat, vibrations and genetically modified organisms-related damage. This also implies higher costs for the proposal.

Third, the directive gives Member States discretion to chose between joint and several and proportional liability where it is not possible to apportion liability on factual evidence. Joint and several liability facilitates cost recovery from liable parties, proportional liability is likely to facilitate insurability, but either way the total costs of the regime are likely to remain roughly the same. A proportional standard will increase the cost share of the Member States competent authorities and correspondingly decrease the share of the private parties (when private parties are not liable, competent authorities are under the obligation to ensure that restoration takes place).

Fourth, Superfund attaches liability to a wide range of potentially responsible parties, from the generators and transporters of hazardous substances to the operators of waste disposal sites. The proposal only attaches liability to the operators. This will not lower total costs vis-à-vis Superfund (since, again, when there are no private responsible parties the competent authority must ensure that restoration takes place) but will increase the competent authorities' cost share.

Finally, not all costs stemming from the proposal will be new, additional costs, since Member States already have in place cleanup liability legislation. However, the existing Member States laws do not impose on public authorities a generalised obligation to cleanup and restore even when no liable party can be found or is able to pay. The directive also covers environmental damage in a much more systematic way than existing national approaches. All in all, a very substantial part of the directive costs are likely to be new, additional costs, though it is impossible to say which will.

The assessment made also touches on the issue of the direct impact of the costs on industry external competitiveness. This is not likely to be significant⁷. This conclusion

⁶ The bulk of the costs of CERCLA are associated with waste disposal.

is grounded on two major arguments. First, liability is unlikely to affect all firms in any given industry in the same way. Firms that adopt cost-efficient preventive practices are unlikely to be saddled with significant liability-related costs and therefore their international competitiveness will be unscathed. Secondly, even with the significantly larger cost impact of Superfund, the U.S. industries with higher cleanup costs⁸ did not experience any significant deterioration of their international competitiveness.

⁷ Abstracting from the differences between CERCLA and the directive other than retrospectiveness. The consolidated impact of the other differences cannot be meaningfully anticipated at this point in time.

⁸ Chemicals, mining, primary metals, lumber and wood products, fabricated metal products excluding machinery and petroleum refinery.

I. Introduction

The directive is one of the policy responses to a serious environmental problem in the EU – the dramatic acceleration of the loss of bio-diversity over the last decades and the accumulation of soils contaminated by hazardous substances– there are now more than 1.5 million industrial and waste disposal sites in the EU which could be potential sources of soil contamination, some 300 000 of which having already been identified⁹ as definitely or potentially contaminated. The proposed directive applies only to future damage, but should break the negative trend of the past.

This is a problem which afflicts all EU Member States and one whose magnitude one cannot emphasize enough. It would probably be necessary to mobilize billions of € each year for a long period to deal with this disastrous legacy of the past. Without adequate action, it is likely that soil and water contamination will keep on increasing and the loss of bio-diversity will not be reversed. Existing regulation and other existing policy instruments have not been able to solve the problem.

The problem at hand is of EU significance and lack of EU action would possibly lead overtime to a patchy legal framework across the EU likely to hinder the free movement of goods and services within the internal market and of creating market inefficiencies. Moreover, no MS has so far instituted on its own liability for damage to natural resources as such. The proposed directive creates liability for future environmental damage. It is not aimed at cleaning up existing contaminated sites, since liability is ill-suited to deal with past pollution in the sense that it cannot change past behavior.

Liability is not an alternative but rather a necessary complement to regulation and market-based instruments, therefore the question is not whether one should use one or the other instrument but rather how to use them together consistently and efficiently. Several alternatives were considered as to the specific features of the liability framework and the choices made are justified in the explanatory memorandum.

It was not possible to quantify the benefits of the proposal, but they are expected to be very significant. Health-protecting, welfare-enhancing and cost-effective restoration of environmental damage is the more visible expected benefit from this proposal but perhaps more importantly it should lead flexibly to more efficient prevention levels.

This assessment focuses on an assessment of the costs of the proposal. That only costs are quantified and thus visible should not cloud judgement as to the merits of the proposal. Doing nothing is not an acceptable or more socially desirable option since the social costs would possibly be even higher (more contamination, less bio-diversity) and the benefit associated with more efficient levels of prevention would not be secured.

This assessment is organized in three parts: after this introduction, the second part discusses the economic purpose of liability and its effectiveness. The effect of liability

⁹ *Environmental signals 2001*, EEA

on prevention, the role of financial assurance and the assessment and valuation of natural resource damage are addressed in this part.

The third part is the more developed one and focuses on the cost impact of the proposed directive. It is based on the costs with Superfund, the main U.S. legislation mandating the cleanup of sites contaminated by hazardous substances and the restoration of damages caused to natural resources by the release of those substances. Under Superfund, the parties responsible for the contamination and the damage to natural resources are liable for the costs of cleanup and restoration.

The first two sections of part III explain the approach followed (section 1) and give a detailed overview of the costs with Superfund (section 2), including total costs, the distribution of the costs by the government sector and the private parties, the type of costs and the type of contaminated sites. The impact on small and medium enterprises (SMEs) is addressed. The costs with the State Superfund programs are discussed¹⁰ and a separate sub-section is dedicated to the natural resource damages.

The last section (section 3) of the third part addresses the main differences between Superfund and the draft EU directive and singles out, quantitatively where possible, their possible impact on costs. The underlying approach is to estimate what would have been the costs of Superfund were it to be based on the same principles as the draft directive'. This yields an estimate of the possible costs with the draft directive.

The key sub-section of section 3 is the one that estimates what would have been the cost impact of a non-retrospective Superfund. This provides the more pertinent reference point for the costs with the draft directive. It is not possible to quantify the cost impact of the other differences between Superfund and the draft directive though they may well result in significant differences in the cost impact. A qualitative assessment of the possible impact of these other differences is made.

II. The economic purpose of liability and its effectiveness

1. Introduction

The economic purpose of liability is to make injurers internalise external costs, i.e. the costs that result from harms caused by the injurer's activity but are borne by third parties, the public when the harm is inflicted on public goods.

In most cases, there is good public information about the benefits and costs of products and services and a properly functioning market for them. Consequently, their benefits and costs are internalised in the marketplace through the prices. However when these market mechanisms do not work properly many of the costs stemming

¹⁰ Superfund is a federal program covering only contamination and natural resources damage of federal relevance. There are similar programs, the State Superfunds, at State level. The proposed directive covering contamination and natural resources damage of both Community and national relevance, this assessment looked at the costs of both the federal Superfund and the State Superfunds.

from the underlying activities fail to be reflected in the market prices and are not shouldered either by the producer or by the consumer, ending up being paid up for by the community as a whole.

Information asymmetries, for instance when the producer has better knowledge of the potential risks posed by his activity, is often at the root of the externalisation of costs. Another common cause of cost externalisation are high transaction costs of the private agreements that would be necessary to allocate contractually the costs of possible harms among private parties in the absence of liability or regulation (e.g. the operator of a landfill cannot negotiate directly ex-ante with every person whose health might be injured by the landfill emissions). The lack of clearly defined trustees for natural resources, as well as perceived difficulties in valuing environmental damage, have also led to the externalisation of many damages to natural resources.

Liability, jointly and consistently used with regulation, can lead to better internalisation of costs and hence to “getting the prices right”. This internalisation comes about in two different ways: first, polluters have to pay for restoring and/or compensating for the damage their activities have caused; secondly, faced with a credible liability threat, potential polluters have incentives to invest in prevention at the efficient level and thus protect efficiently the environment.

Investments in prevention are efficient as long as one € spent on prevention avoids damage whose restoration would cost more than one €. A credible liability threat thus leads to efficient and responsible behaviour by private parties. In turn, this leads to a minimisation of the social costs with environmental damage, i.e. the sum of the costs with prevention (avoiding incidents that would cause damage) and the costs of restoring damage once it occurs, obviously a desirable outcome.

However, a number of practical circumstances may weaken the effect of liability on prevention. This issue is explored in detail in section 2 of this part.

In particular, the effectiveness and efficiency of liability, and therefore its actual impact on prevention, depends crucially on whether the parties potentially responsible for damage have the means to pay for the costs of restoration in the event they are found liable, an issue which revolves around the financial assurance of liability. This is discussed in section 3 of this part.

Section 4 focuses on the assessment and valuation of natural resources damage and motivates the methodology proposed in the draft directive.

2. The effect of liability on prevention

The effect of liability on prevention is thus key to its economic efficiency and there are good reasons to assume that potential polluters will invest efficiently in prevention if they perceive as credible the threat of being held liable for remediating or restoring the damage they may cause.

However, whether environmental liability regimes have in practice noticeable effects on investments in prevention or not depends on a number of circumstances that

influence the behavioural changes expected, such as the credibility of the liability threat (which in turn depends notably on the enforcement capacity to implement the regime) and whether or not potential liabilities are financially assured. Ultimately, the prevention effect of environmental liability regimes is a matter for empirical analysis. Thus the Commission has launched a study aimed at assessing empirically the effectiveness of strict liability in terms of prevention and damage avoidance.

2.1 The Commission study on the preventive effect

This study <http://www.europa.eu.int/comm/environment/liability/preventive.htm> focused on assessing the effectiveness of strict liability in terms of increased levels of prevention and the significance of the substitution effect. This effect is a reaction to the imposition of liability rules whereby firms substitute activities likely to be shielded from liability for activities where the liability threat is perceived to be more serious. Examples of the former are largely diffuse air emissions, whereas single or multiple source emissions with clear causation links to possible damage illustrate the latter case¹¹.

The study focused on the U.S. case given that the U.S. has a longer experience with environmental liability than EU Member States. In effect, the U.S. Superfund program, a liability-based program which aims at cleaning up contaminated land and restoring damage to natural resources, was enacted already in 1980. Most U.S. States also have State Superfund laws and differences in State environmental liability standards (strict versus fault-based standards) allow for isolating the potential effect of strict liability.

The analysis attempted at answering the following question: are plants substituting more liability-shielded emissions (e.g. air emissions) for emissions more liability-prone (e.g. waste disposal on landfills)? In other words, do data on plant-level emissions suggest plants are trying to escape liability by releasing emissions into one media rather than another? If they were, the effect of liability on prevention would be significantly weakened.

The research has been complicated by the relatively low quality of the data available on plant emissions. The results achieved so far indicate that to the extent that liability is leading to lower emissions, there is little if any undesirable substitution going on. In other words, on the basis of the findings liability should be delivering the intended positive incentives for prevention. However, the significance of the findings is not entirely satisfactory due to insufficient and/or low quality data.

Further research is being conducted to fine-tune the findings. The operational conclusion at this stage remains that, on the basis of the best data and models available at this point in time, there is no reason to believe that the expected positive effect of liability on prevention is not holding.

¹¹ Firms may also substitute away from potentially liable activities by spinning off or delegating risky activities to liability-shielded entities (e.g. sub-contracting risky activities to firms thinly capitalised that go bankrupt in the event of a liability suit).

3. Financial assurance: a necessity for the preventive effect to hold and for ensuring effective restoration of the environment

The effectiveness of liability in bringing about a change in attitudes towards preventative behaviour, and appropriate restoration of environmental damage, depends to a large extent of whether potential damage is financially assured or not.

The proposal for the EU directive does not require mandatory financial assurance from firms involved in activities that pose significant environmental risks but imposes an obligation on Member States to take the measures necessary to restore significant environment damage in all circumstances. Member States shall either require the liable operator to take the necessary restorative measures or take the measures themselves and recover the costs of so doing from the relevant operator. When a liable operator cannot be identified or has not sufficient financial means, Member States are also under the obligation to restore. Ultimately then it is Member States that ensure that restoration and cleanup will take place in the event of damage and/or contamination.

Member States can discharge of this obligation in several ways, e.g. by setting up restoration funds financed by taxes imposed on specific industries and companies or by making financial assurance mandatory for companies engaging in activities likely to pose significant environmental risks. They may also rely on voluntary financial assurance coverage in the marketplace.

It was therefore important to explore the challenges associated with, and the feasibility of, financial assurance for liabilities arising under the directive. In other words, investigating whether the liabilities can be financially assured and also whether similar liabilities have actually been assured.

3.1 The studies conducted on the financial assurance issues of environmental liability

Two studies were dedicated to investigating the financial assurance issues of environmental liability, one on the general issues http://www.europa.eu.int/comm/environment/liability/insurance_gen.htm and the other on the issues associated with U.S. natural resource damage liability http://www.europa.eu.int/comm/environment/liability/insurance_us.htm.

Part of the research discusses the general economic model of liability and the conditions under which liability is expected to be an effective and efficient policy instrument. It shows that liability cannot be used in isolation and should be accompanied by efficient regulation. Minimising the social costs with pollution can only be achieved if liability and environmental protection regulation are used consistently and efficiently, as complements rather than substitutes. The lesson to be drawn is that setting up a liability net does not dispense regulators from keeping an efficient system of environment protection regulations and norms.

The other part of the research was empirical and focused on the U.S. experience with the financial assurance of environmental liability. This part dealt mainly with the

financial assurance of natural resource damage (NRD) liabilities since it is often argued that these liabilities are more difficult to assure financially than liabilities for the cleanup of contaminated sites.

At this time, the U.S. has financial assurance regulations associated with several of its most important federal environmental laws. Financial assurance is required under the Oil Pollution Act (OPA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and several other federal statutes. The study focuses on OPA and CERCLA because these statutes are the federal statutes that make polluters liable for NRDs and require financial responsibility as well. Financial responsibility under these statutes is not for NRD alone but also covers a host of other damages for which firms can be held liable, including pollution response and removal costs and lost government revenue.

The overlap between federal NRD liability and financial assurance arises in the context of two financial assurance “rules” implemented by the U.S. government. The first rule, authorised by both OPA and CERCLA, governs water-borne vessels that carry oil or hazardous substances. The second rule, authorised by OPA, governs offshore facilities used for oil exploration, drilling, production, or transport.

OPA and CERCLA require financial responsibility coverage for amounts up to statutory liability limits. Accordingly, the liability limits are identical to the financial responsibility coverage requirements¹².

It is difficult to ascertain whether or not the liability limits established under U.S. law are optimal in a legal or economic sense. Lowered liability limits will reduce compliance costs and improve insurability. Lowered limits will also reduce deterrence and make cost recovery more difficult. Given the relatively recent implementation of these rules it is difficult to draw a firm conclusion regarding the desirability of the limits established under these U.S. programs.

An important policy question is whether financial assurance for environmental liabilities should be made mandatory. An alternative, of course, is to rely on the voluntary provision of environmental coverage by private markets. If left to themselves, private markets will demand and supply some level of environmental insurance coverage.

The question, of course, is whether markets will voluntarily provide adequate insurance coverage from the standpoint of public policy. When purchased voluntarily, insurance benefits the purchaser by reducing risk. However, insurance also tends to foster cost internalisation, which is at odds with firms’ profit motive. Given the large potential scale of environmental damages and the inability of many firms to internalise those costs mandatory financial assurance is desirable on

¹² While the financial responsibility coverage requirement is equal to the liability limit, defendants can be liable for greater amounts. There is no liability limit if a release or threatened release is determined to be caused by “gross negligence or willful misconduct of, or the violation of any applicable Federal safety, construction, or operating regulation by the responsible party” or if the incident is not reported in a timely fashion

theoretical grounds and is possibly the most effective (if not the only) policy mechanism capable of ensuring that environmental costs will be internalised.

All in all, financial assurance is an increasingly common component of U.S. environmental compliance programs. The overall picture is of a set of programs that have been implemented with success. By and large, private sector coverage mechanisms are available, and at rates that can be absorbed by most of the firms to which the requirements apply. Coverage availability is improving over time and premiums are falling. Notwithstanding the valuation difficulties associated with natural resources damages, markets for their assurance have developed with little difficulty.

The key implications of the U.S. experience for the EU are that:

- The liability imposed on operators by the draft directive is likely to be financially assured, notably through insurance. This includes NRD liability. Insurance in the EU may however prove more difficult to get and/or more expensive than in the U.S., given that, unlike the draft directive, the U.S. statutes exclude from liability damage caused by federally permitted releases and provide for other potentially significant exclusions from liability. However, all else the same insurability will be easier in the EU in the Member States that will opt for proportional liability (the U.S. applies joint and several liability)
- In contrast to U.S. liability, the draft directive imposes unlimited liability. This may make insurability more difficult and/or more expensive (at least until insurers build up sufficient experience with the regime), particularly in the MS that would opt for a joint and several liability standard.
- In the absence of mandatory financial assurance for operators, it is unlikely that the latter will seek to insure voluntarily to any significant extent their potential liabilities.
- There are several ways of providing financial assurance but insurance cover is likely to be, by large, the most significant one.

4. How to assess natural resource damage

Natural resource damages remain controversial and difficult to value. The option retained in the draft directive for the assessment and valuation of NRDs was developed on the basis of a study on the valuation and restoration of damage to natural resources for the purpose of environmental liability (<http://www.europa.eu.int/comm/environment/liability/biodiversity.htm>) and is similar to the approach used under the U.S. OPA (for a summary of this approach see http://www.europa.eu.int/comm/environment/liability/tp_enveco.pdf).

The approach retained favours restoration over monetary measures largely because restoration costs are easier to estimate, rely on fewer untested economic valuation methodologies, and are verifiable ex post. The draft directive also gives an explicit preference to the least cost option amongst alternatives likely to deliver similar environmental benefits.

III. Overall cost impact of the draft directive

1. Introduction

This assessment is based on the experience with the U.S. Comprehensive Environmental Response, Compensation and Liability Act, CERCLA, commonly known as Superfund. The Commission dedicated one study, “The Potential Economic Impact of Environmental Liability: The American and European Contexts”, <http://www.europa.eu.int/comm/environment/liability/comp.htm>, specifically to this topic. This assessment draws largely on the conclusions of that study and on the most authoritative analysis of Superfund costs to date¹³.

It was not an option to base this assessment on existing Member States’ liability regimes. In effect, the draft directive creates a regulatory environment that is qualitatively and significantly different from the existing environment liability regimes in Member States, which focus mainly on property damage and health injury and have a variety of defences/exemptions and/or mechanisms to channel liability to potentially responsible parties different from the directive’s. Cost data on the Member States’ environment liability regimes is also notably scarce (probably because many of them are quite recent), as the Commission’s study on the ‘Economic Aspects of Liability and Joint Compensation Systems for Remedying Environmental Damage’ (ERM, March 1996) concluded.

On the other hand, Superfund was passed into law more than twenty years ago and covers natural resource damage as well as the clean-up of soil and water contamination posing serious threats to human health. Perhaps more importantly there is a wealth of information on its cost impact that can be used to illustrate the potential cost impact of our draft directive.

In section 2 of this part the cost impact of the U.S. federal Superfund is analysed. A separate sub-section is dedicated to the State Superfunds (unless otherwise stated, the costs mentioned refer to the federal Superfund). The costs associated with the States Superfunds are relevant for the EU because the draft directive covers damage that in the U.S. is covered both at federal and State levels.

Section 3 assesses the potential cost impact of significant differences between Superfund and the draft directive, in as much as these differences are likely to result in significantly different cost impacts. An estimate of the likely costs associated with the draft directive is then derived, subject to the caveat that it is not possible to quantify the cost impact of a number of significant differences between the U.S. approach and the draft directive’.

It is worth saying that the derived cost estimate is associated with high levels of uncertainty since, on the one hand, the underlying data is imprecise and incomplete

¹³ *Footnoting the Bill for Superfund Cleanups*, Katherine Probst *et al*, Resources for the Future, 1995. The same author, together with other researchers, has recently published a new study of the future Superfund costs, *Superfund’s Future : What Will it Cost ?*, RFF, July 2001, which we have also used (at the time of drafting this assessment only the executive summary of the latter study was available).

and, on the other, there are a number of significant differences between Superfund and the draft directive that it is not possible to quantify. Having said this, the estimate is the best available one.

2. The cost impact of Superfund

This section starts with a brief description of Superfund. Sub-section 2 gives an overview of Superfund overall costs and puts these costs into perspective. Cleanup, transaction costs and Superfund taxes are addressed subsequently. Sub-section 6 treats the distribution of costs among institutional actors and sub-section 7 the distribution of costs by industry sectors. The type of sites in Superfund is the object of sub-section 8. Sub-section 9 focuses on the costs for small and medium enterprises. Finally, sub-sections 10 and 11 address respectively the costs with NRDs and the State Superfund programs and related costs.

This analysis focuses on the costs associated with cleanups of contaminated sites and transaction costs (mainly legal costs associated with litigation), as existing data suggests that the costs with natural resource damage (NRD) are only a small fraction of the cleanup costs. Hence, unless otherwise specified, the costs presented below exclude NRD costs. The latter are analysed in a separate sub-section.

2.1 What is Superfund

Superfund is a law which mandates the U.S. Environmental Protection Agency (EPA) to identify contaminated sites that warrant cleanups, and then to either initiate these cleanups and then compel the parties responsible for the contamination to pay for the cleanups through a liability process, or compel the responsible parties to undertake these cleanups directly. When the responsible parties cannot be identified or are insolvent, the cost of cleanup is covered by funds raised from a trust fund created from excise taxes on petroleum and specified chemical feedstocks and a corporate environmental income tax¹⁴. It is this trust fund that gives Superfund its name.

Under Superfund responsible parties are also liable for natural resources damage (NRD). The U.S. Environmental Protection Agency (U.S. EPA) is directed to restore this damage, either through direct restoration or replacement of the damaged resource by an equivalent one. As with the cleanups, EPA can either initiate the restoration and then compel the parties responsible for the contamination to pay for the restoration through a liability process, or compel the responsible parties to undertake the restoration directly.

Sites designated as Superfund sites are referred to as National Priorities List (NPL) sites. NPL sites are so designated because they are thought to be amongst the worst in the country. Corrective action on NPL sites is driven mainly by the threat their contamination poses to human health and the well being of their surrounding communities, as well as to natural resources. Traditional damages, such as damages to

¹⁴ Since 1996 the Fund has been fed only by general government revenues as the taxes were discontinued.

personal health and property, are not addressed and cannot be recovered under Superfund. Contaminated sites that are not deemed hazardous enough to be placed on the NPL may be addressed through state cleanup programs in place in all fifty states.

The Superfund liability is retrospective, i.e. it applies to damage caused by events that took place before the law was enacted. The liability standard has been interpreted by the courts as strict, i.e., liability still attaches even if the liable party was not at fault. In the event that the damage proves indivisible, Superfund liability is joint and several. Liability is also capped and three main exemptions from liability are foreseen in the law: for damages identified ex-ante in environmental impact statements, for damages caused by registered pesticide products and for damages caused by federally permitted releases.

2.2 Superfund overall costs

The main costs considered here include the costs of cleaning up contaminated sites (the bulk of the costs of the program) and transaction costs (mainly the costs associated with litigation). Costs with NRD are discussed separately. To date relatively few sites have been associated with the restoration of NR but on the basis of existing evidence such costs are unlikely to greatly increase Superfund costs. The costs of administering the program are discussed in the section on the distribution of costs by institutional actors. Superfund taxes are included, and discussed separately.

Annual spending in the U.S. pursuant to Superfund was, at its peak, about \$6 billion USD, including expenditures by all parts of the federal government and all spending by private parties for cleanup, Superfund taxes and transaction costs. This represents less than 5% of the cost of complying with all federal environmental regulations in the U.S. and should not be unduly burdensome to most industries though it can be painfully expensive for a relatively small group of parties responsible for damages.

Another way of putting the overall Superfund costs above mentioned in perspective is realizing that they account for around 0.08% of GDP, which though being a sizable sum, is not a significant share of GDP.

2.3 Cleanup costs

The most comprehensive estimate of Superfund cleanup costs available¹⁵ puts the annual cleanup costs of the program at 1559 million USD for private parties and 585 million (1993 USD)¹⁶ for the federal government. The estimate dates from 1995, does not consider costs incurred before 1994, and was based on the assumption that no more contaminated sites would be added to the list of sites that had been identified as Superfund sites as of 1994 (1134 sites), an assumption that has been proved unrealistic by an expanding list of Superfund sites. It was also assumed that the cleanup would be completed in ten years (by 2004).

¹⁵ From *Footnote the Bill for Superfund Cleanups*, referenced in footnote 4.

¹⁶ What corresponds to 1890 million USD and 709 million in 2000 USD (after correcting for inflation), respectively for the private parties and for the federal government.

However, a more recent analysis of Superfund costs¹⁷ not only projects that cleanup costs for the federal government will not change much at least until 2009 (the time horizon of the analysis), but also suggests that new contaminated sites will keep on being added to Superfund at a roughly constant and significant rate.

If we consider this information together with the fact that Superfund has now a 31-year history, the more realistic assumption is that cleanup costs will remain relatively constant over a time span long enough that, for practical purposes, we may reason as if they were roughly constant forever¹⁸.

2.4 Transaction costs

Those critical of liability to fund cleanups point out that liability generates high transaction costs, i.e. costs that are incurred in formalities rather than on the cleanups. Most liability-generated transaction costs are legal costs. It has been estimated that legal costs accounted for 75% of the transaction costs.

The most recent conventional wisdom is that transaction costs average 21% of responsible parties' total (cleanup and transaction) costs. Transaction costs are also a function of the number of responsible parties at each site. On average, the higher the number of responsible parties at a site, the higher the transaction costs as a percentage of total costs. It should be noted that this is less of a concern in the EU where only the operators in control of the activity that caused the damage can be held responsible for the damage. Then, in the EU, the number of potentially responsible parties at a site is likely to be lower than in the US, where the potentially responsible parties are broadly defined as any party that is even remotely connected to the transportation of hazardous materials to, disposal or generation at, or past or present ownership of the site. Under Superfund, lenders and insurers are immune to a certain extent but otherwise few other parties are.

Even as the Superfund transaction costs (and their magnitude) may be perceived as a sign of inefficiency, that is not necessarily the case. Every policy instrument generates transaction costs, even typical economic incentives which are, and rightly so, considered comparatively efficient. For instance, the transaction costs associated with collecting dedicated taxes that raise relatively low revenues (such as the taxes that used to provide most of the revenue of the Superfund trust fund) are often much higher than the 21% estimate for the liability transaction costs.

2.5 Superfund taxes

One of the major arguments against funding cleanups and natural resources restoration through liability is that liability generates significant transaction costs, as

¹⁷ *Superfund's Future : What Will it Cost ?*, referenced in footnote 4.

¹⁸ Of course, from a static perspective one would expect that costs would decrease overtime as old problems are identified and eventually solved. However, as the GMO debate clearly shows, new forms of contamination appear inevitably as we solve older problems. Therefore, from a dynamic perspective, it is not that surprising that cleanup and decontamination costs are relatively resilient.

discussed above. But the alternative policy options are command-and-control regulation and some form of taxation and none of them is exempt of transaction costs.

Command-and-control regulation is normally associated with high enforcement costs and, in isolation, is not cost-effective. It is also ill-suited to situations where the private parties possess better information about the risks posed by their activities, the costs of reducing these risks or the probability or magnitude of the risks. This is likely to be the case in many situations to which the draft directive will apply.

Taxation is the other option, and indeed several taxes have been used under Superfund to fund cleanups, restoration work and urgent interventions by the public authorities.

Three different Superfund taxes were created¹⁹ – excise taxes on chemicals and petroleum, and a corporate environmental income tax, which had an almost imperceptible effect on the economy as a whole. The taxes raised minuscule amounts of money each year in relation to GDP (\$1.3 billion in a \$6 trillion economy) and were broadly distributed throughout the economy so that no one industry was overly burdened. The effect of the taxes on product prices was also negligible.

However, given in particular the relatively low tax revenue of these taxes, they were inefficient in the sense that the administrative and compliance costs which they imposed were quite high, may be as high as the revenue raised, and possibly higher – for the corporate environmental income tax. This suggests that it may be more efficient to use general tax revenues or, at least, broader environmental taxes to fund cleanup or restoration funds than to rely on dedicated taxes.

The draft directive leaves to the national authorities the decision on whether to use taxes (and the form they may take), to fund cleanups or restoration work where the responsible party cannot be identified or cannot be made to pay²⁰.

Political feasibility considerations may well dictate the use of taxes to fund ‘orphan’ (where no responsible party can be identified or made to pay) cleanups or restoration work, but the mechanism more likely to be in the spirit of the polluter pays principle remains ex-ante financial assurance (which in turn does away, at least to a large extent, with orphan sites).

2.6 Distribution of costs by institutional actors

According to existing analysis the trust fund pays for 30% of the total cleanup cost and the private responsible parties for 70%. The share of the trust fund is explained by orphan sites or orphan shares of damage that liable parties cannot be made to pay.

¹⁹ The taxes were discontinued after 1995 and government expenditures have been funded out of general government revenues since then.

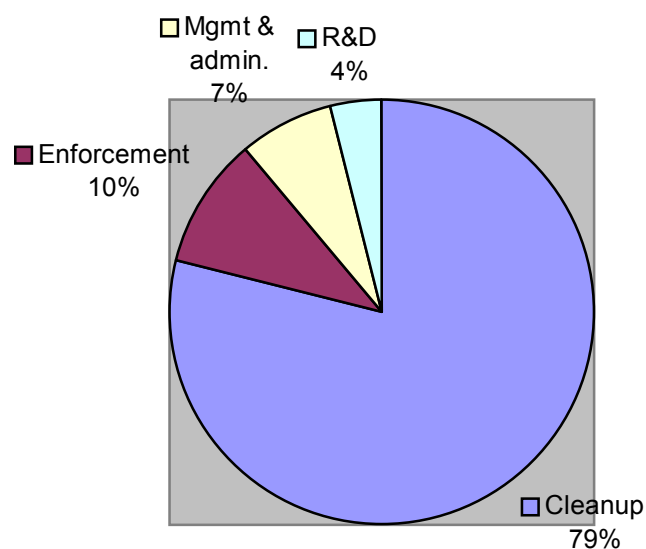
²⁰ In this regard, it is important to note that existing analysis of Superfund taxes shows that these taxes are not really in the spirit of the polluter pays principle. This is because the tax burden, even if targeted at the industries most likely to contribute to the damage, is unlikely to fall only on the managers or stockholders of the firms responsible for actual damage. In other words, the tax burdens are diffuse, rather than targeted at the actual polluters

Many sites also start out with some site studies and cleanup activities that, in practice, are not entirely recovered from liable parties.

This translated into annual costs of 585 million USD for the trust fund and 1.5 billion USD for private responsible parties (1993 USD, see section 2.2 above). These figures take into account that cleanups done by private parties have been found to be, on average, 20% more cost-efficient than the cleanups done by the government.

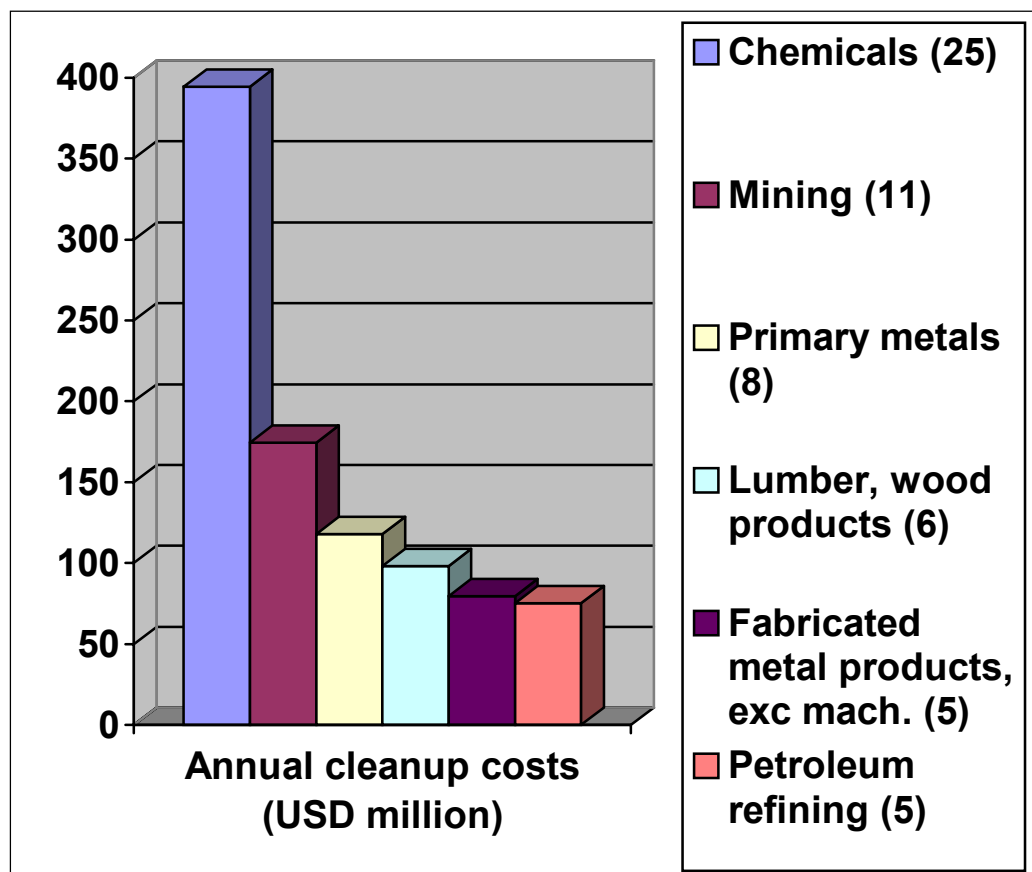
These costs for the trust fund do not include the day-to-day costs of operating the Superfund program, which in 1995 amounted to about 1 billion USD annually, nor the transaction costs (enforcement) and the R&D costs supported by the government. The distribution of all Superfund costs for the (federal) government sector is given in the graph below.

Trust Fund Expenditures, 1981-93



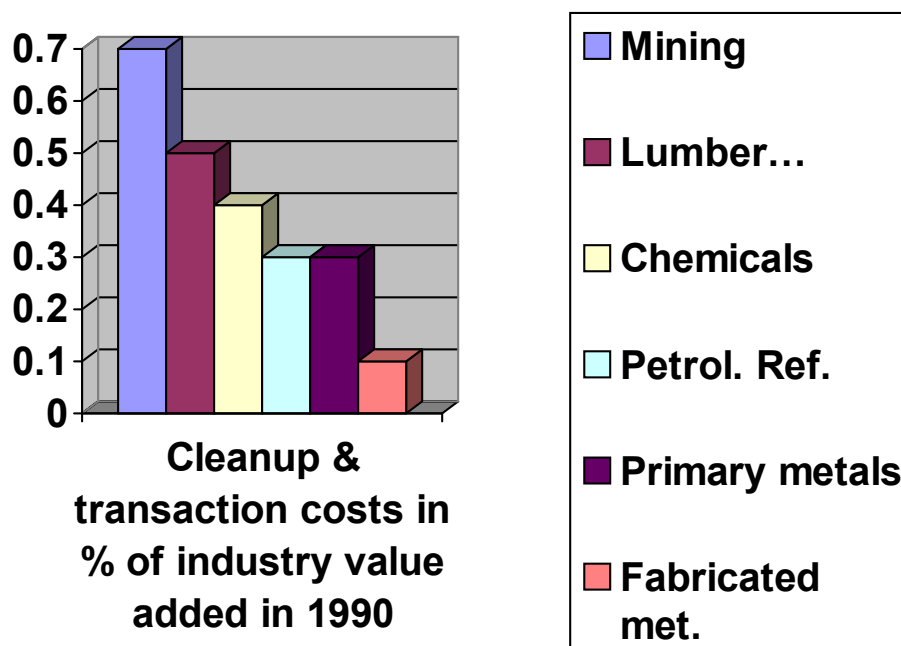
Although the trust fund expenditures were financed up to 1995 by the Superfund taxes, the taxes were discontinued and the share of the government has of late been funded instead by general government revenues.

2.7 Distribution of costs by industry sectors



The graph above breaks down the responsible party cleanup costs by industry. The figures between brackets represent the percentage share of each industry in the total responsible party cleanup costs. The largest costs are shouldered by the chemicals industry, which accounts alone for $\frac{1}{4}$ of the total. The mining industry and the primary metals industry sustain the next largest impacts, but at overall levels of costs significantly lower. However, the relative impact on each industry is not adequately portrayed by this picture, depending as it does on the revenues and overall financial situation of the industry.

It is also the case that because not all firms in an industry are encumbered by liability, cleanup and transaction costs are more likely to come out of corporate profits than they are to be recouped through higher product prices. Ideally then, one would compare the cleanup costs of each industry with its profits. Profits are not always easily available and thus we also compare with the value added of each industry (see graph below).



The chemical industry has the highest cleanup and transaction cost share, around 25% of total industry costs as seen above, but its estimated annual cost represents a small fraction of this industry's value added, less than 1% in 1990. As a percentage of the industry after-tax profits in 1991 and 1992, the estimated annual cost is just over 2%.

The petroleum refining industry appears to be even less encumbered by its liability costs. They represent typically less than 1% of the average annual profits of the twenty leading firms over a relative long period (1982 to 1991).

The mining industry is an exception. Its liability costs account for the highest share of value added among all industries (0.7% in 1990) and because its profitability record has been poor in recent years the costs weigh heavily on profits (or increase substantially its losses). The mining sites in the NPL are also the most expensive sites to cleanup. An 1991 estimation of the average cleanup cost of a mining site puts it at 170.4 million USD. This compares with 41.1 million for a chemical manufacturing site and 29.1 million for the average of all sites.

The primary metals industry, which also faces substantial cleanup liabilities, is somewhere between the mining industry and the chemicals industry in terms of estimated liabilities relative to profits – the estimated liabilities account for about 11% of industry profitability as averaged over a recent ten-year period and for about 5% over a recent five-year period (1988-1992). Data on the profitability of the other industries affected by liability was not available.

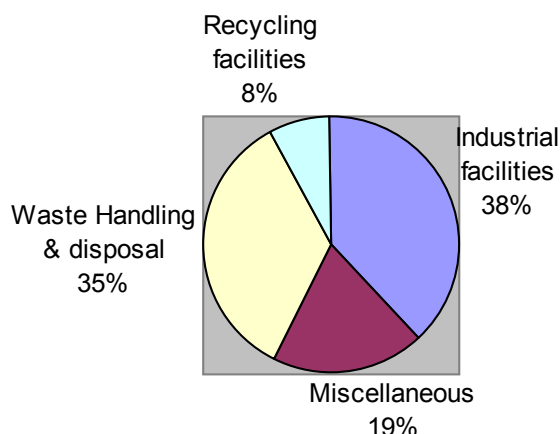
The relative similarity between the pollution covered by the draft directive and Superfund, as well as the similarity of the economic structures in the U.S. and in the EU, imply that the distribution of costs by industry sectors in the EU should be broadly similar to the U.S. case if the potential responsible parties would be the same under the draft directive and Superfund. However, they are not. Under the EU draft

directive only the operator in charge of the polluting activity can be held liable while under Superfund there is a wide range of potentially liable parties, from the generators of the hazardous substances to the transporters to the operators of waste handling and disposal. Thus, whether or not the pattern of responsible industries in the EU will follow the U.S. pattern depends on the legal interpretation that will emerge of the draft directive.

Under one possible interpretation –e.g. the operators of waste handling and disposal installations are liable but the upstream generators of the hazardous substances whose disposal eventually causes the damage are not – the liability burden on the EU will tend to fall more on the downstream parts of the hazardous substances life cycle and less on the upstream industrial generators of the hazardous substances.

2.8 The type of sites in Superfund

National Priority List Sites, by Site Type



In terms of the number of sites, industrial facilities (including mining)²¹ account for the highest number of priority sites, but waste handling and disposal also accounts for more than 1/3 of the number of sites. If we extend the concept of waste handling to include recycling, then this becomes the major category in the NPL. If we take more homogenous categories of sites, landfills are the single most important category.

The graph above refers to the number of sites. The distribution of cleanup costs by site type is not available according to the categories above, but there is a 1991 study which estimates the distribution of site cleanup costs by a finer classification of sites. The estimates are given in the table below.

²¹ It is worth mentioning that while industrial facilities are generally manufacturing sites, these sites may have been contaminated by in-house landfilling and waste handling and disposal activities.

Site Cleanup Cost Estimates, by type of site		
	Cost (million USD)	% of total
Landfill	9,351	32.4
Mining	5,113	17.7
Chemical manufacturing	3,825	13.3
Manufacturing	2,645	9.2
Wood preserving	2,154	7.5
Surface impoundment	1,993	6.9
Wellfield	965	3.3
Radiological tailings	678	2.3
Waste oil	613	2.1
Electrical	553	1.9
Leaking container	515	1.8
Drum recycling	189	0.7
Metal working	130	0.5
Plating	98	0.3
Asbestos	38	0.1

Landfills account for around 1/3 of total cleanup costs and mining sites for almost 1/5. Landfills and mining sites, together with the chemical manufacturing sites, account for roughly 2/3 of total cleanup costs.

2.9 Costs for SMEs

In 1998, RAND conducted a study for the U.S. EPA that attempted to address the impact of Superfund on SMEs.²² The study found that between 38 and 56 percent of the responsible parties at the sites studied have annual revenue less than \$3 million USD, and between 46 and 68 percent have annual revenue less than \$10 million. Similar estimates resulted for responsible parties with fewer than 25 and 50 employees, and the study further concluded that the responsible parties defined as small businesses based on annual revenue more or less overlap with the responsible parties so defined based on the number of employees.

The study then went on to estimate the share of cleanup costs attributable to small business responsible parties based on the percentage of their contribution to the volume of waste at the sites studied. Estimates ranged from 11 to 22 percent for firms with annual revenues under \$3 million, and from 12 to 24 percent for those with annual revenues less than \$10 million. The ranges based on the number of employees were somewhat higher. It is not clear that cleanup costs are essentially driven by the volume of cleanups. An analysis of actual cost contributions by small business responsible parties at sites where this information was available suggests that they contribute much less than their volume-based cleanup costs.

²² See “*The Financial Implications of Releasing Small Firms and Small-Volume Contributors from Superfund Liability*,” Dixon, Lloyd S., RAND Institute for Civil Justice (DRU-1366-2-EPA) August 1998.

The same research institute, RAND, also analysed the transaction costs to smaller firms. While RAND estimated transaction costs for all responsible parties prior to 1992 to equal on average 32 percent of total cleanup costs, the corresponding estimate for firms with annual revenues of less than \$100 million was 60 percent.²³

Superfund was also significantly amended in 1986 by the Superfund Amendments and Reauthorisation Act (SARA). In particular, SARA allows EPA to release from liability *de minimis* parties, i.e. those responsible for only a small amount of the contamination at a site. This almost certainly lessened Superfund's impact on SMEs.

2.10 The costs with Natural Resources Damage (NRD)

The draft directive imposes liability for damage to bio-diversity. In essence, this is liability for natural resources damage, which is legally distinct from liability for the cleanup of contamination. Liability for NRD is essentially new in the EU, few if any Member States impose specifically liability for NRD as such. Therefore, there is great concern with the essentially new costs with NRD that stem from the implementation of the draft directive.

Here again, the U.S. experience is quite enlightening. In the U.S. there are two main statutes that make polluters liable for NRD: Superfund and the Oil Pollution Act. Experience with both strongly suggests that liability for NRD is quite unlikely to increase substantially the cleanup costs.

For what regards Superfund, to date relatively few sites have been associated with the restoration of NR. On the basis of existing evidence such costs are indeed unlikely to greatly increase Superfund costs.

The U.S. General Accounting Office (GAO) has produced several reports on the subject. A recent one²⁴ states that “the two principal federal natural resource trustees estimate that as many as 20 sites may have NRD claims exceeding USD 50 million each...and that up to another 40 sites may have claims totalling between USD 5 million and 50 million each”. These estimates are based on limited data, and are thus uncertain, but the fact remains that all available evidence points in the same direction – NRD costs are unlikely to greatly increase cleanup costs.

As of April 1995, settlements for the five largest NRD cases totalled USD 83.8 million, about 4/5 of the total dollar value of all 98 settlements reached to that date.

To put the figures above in perspective, also in 1995 the cost to cleanup all the sites then on the NPL was estimated at USD 33 billion. Then, if we assume (conservatively) that the NRD claims above mentioned will be of USD 75 million for

²³ The authors of Footing the Bill for Superfund Cleanupsthors note: “It is not surprising that RAND found higher transaction cost shares for smaller companies. Part of the transaction cost share is a fixed cost at each site that is not directly related to the total amount spent on cleanup by each company. Because smaller firms are likely to have spent less in absolute terms than larger ones on site cleanups, a higher percentage of their total costs is likely to be for transaction costs.”

²⁴ Superfund, *Outlook for and Experience with Natural Resources Damage Settlements*, GAO/RCED-96-71, April 1996

the 20 more expensive sites and of USD 30 million for the remaining 40 sites, the value of the NRD claims would amount to 8% of the cleanup cost. Beware though that we took here a very conservative view to illustrate the worst case scenario. NRD claims will probably be significantly lower than assumed here.

The NRD settlements as of April 1995 amount to less than 2% of the moneys spent on cleanup by that date (around USD 6.9 billion).

It is also worth noting that, at least up to 1995, almost all NRD claims had been settled without litigation.

The same picture emerges from a more recent analysis of NRD costs involved in oil spills. A 1999 paper, by two officials of the U.S. National Oceanic and Atmospheric Association²⁵, the U.S. trustee for coastal NRD associated with oil spills, concludes that natural resources damages and assessment (NRDA) costs can be significant but it disputes the assertion that NRDA costs constitute the major cost of a spill and threaten industry viability. The paper states that “First, fewer than 1 percent of all oil spills contain natural resource damage assessments. Second, for the incidents with damage assessments in our sample, NRDA claims averaged about 26% of the overall cost of the spill, a figure that is biased upward due to the understatement of other cost categories. Our analysis suggests, contrary to industry opinion, that NRDA claims represent only a small proportion of total liability. In the largest incident by volume and cost, the Exxon Valdez, the NRDA share is 10%, suggesting that if the financial viability of the industry is at risk, NRDA costs are not driving that risk.”

Thus the U.S. experience warrants the conclusion that, based on existing evidence, NRD costs are unlikely to increase significantly the cleanup costs.

2.11 State Superfund Programs and related costs

Superfund is a U.S. federal program and the sites on the NPL are sites of federal relevance. However, in the wake of the federal program the vast majority of the U.S. States have also enacted State laws governing the cleanup of contaminated land and establishing funds to pay for cleaning up non-NPL sites where no responsible party is available or able to do it. For memory, NPL sites are contaminated sites that are of federal importance. Non-NPL sites are contaminated sites of only State relevance.

The State ‘Superfund’ Programs, as they became known, though legally distinct from the federal program, have much in common with the latter. Most are also based on strict, retrospective, joint and several liability. They also cover natural resources damage.

The EU draft directive does not only cover contamination and environmental degradation of EU relevance. It applies also to bio-diversity protected under MS’ laws and to any significant environmental damage that creates significant potential or actual harm to human health.

²⁵ *Putting Response and NRD Costs in Perspective*, Douglas Helton and Rony Penn, 1999

Therefore, in order to extrapolate the costs of the draft EU directive from the U.S. experience, the relevant aggregate of costs is the sum of the costs of the U.S. federal Superfund and of the State Superfunds.

Unsurprisingly, the available information on the State Superfunds is of lower quality and depth than the one available on the federal program. Our basic source of information is a recent study by the Environment Law Institute²⁶. The reporting from the State authorities on which it is based is fragmented and sometimes imprecise. With this proviso, the relevant information available on the cost impact of the State Superfunds is summarised below.

In 1997, there were approximately 69000 non-NPL known and suspected contaminated sites (this may include sites that have not yet been investigated). 24000 had been identified as needing attention, i.e. some type of cleanup.

The amount of State Superfunds administrative expenditure is not known but the aggregate program staff levels, a related indicator, was of 3474 full-time equivalent persons in 1997 (3394 FTE persons in 1991). This figure may include staff undertaking a varied of related activities, such as general hazardous waste programs.

The sources of State Cleanup Funds are quite varied, including appropriations, penalties and fines, bonds, cost recoveries (from private responsible parties), waste fees, taxes, interest, transfers, private funds and user fees. There are no available estimates of the liability-related cost of these programs for private responsible parties.

As to cleanup spending levels, in 1997, the State Superfunds reported spending a total of USD 565 million on cleanups (up from USD 386 million in 1995). The corresponding figure at the federal level (the federal Superfund) is USD 585 million (see above)²⁷.

The aggregate balance available in the State Superfunds, together with the new Fund additions, is also informative. At the end of 1997, the State Superfunds had an aggregate balance of USD 1.413 billion. The 1997 additions to the Funds amounted to USD 538 million, an amount quite close to the year's expenditure, suggesting an expectation of roughly stable expenditures (around USD 550 million), at least in the short-to-medium term.

Since 1989 the aggregate Fund balance has decreased (from 2396 million USD in 1989 to 1413 million in 1997) but it is plausible, though not certain, that the fluctuation is cyclical and due to a significant number of States relying heavily on bond authorisations to feed the Funds and operating on a boom-and-bust cycle, whereby they decrease or delay activities as their fund balances diminish, and then increase expenditures when new monies from bond authorisations arrive. The relative stability of the aggregate Fund annual balance, excluding bonds, around 500-600 million USD, since 1989, lends some credibility to the assumption of roughly stable expenditures overtime.

²⁶ *An Analysis of State Superfund Programs : 50-State Study, 1998 Update*, 1998, Environment Law Institute.

²⁷ The figure for the federal program is an estimation of average annual costs rather than the actual spending of 1997.

Like the federal program, the State Superfunds also cover natural resource damages. But again like in the federal program the costs associated with these damages appear to be dwarfed by the cleanup costs. Up to 1997 the States reported having recovered around USD 277 million in NRD claims, both under State law and under federal law²⁸. However, there are instances where the same amount is reported twice, once under State law and again under federal law. The actual amount is probably lower.

On the basis of the information available, we conclude that taking the federal and the State programs together may double the cost impact of the federal program alone, at least for the government, though this conclusion rests on information that, at the State level, is relatively imprecise and therefore uncertain.

3. Significant differences between Superfund and the EU draft directive and their potential cost implications

The long experience with Superfund, its broad similarity with the goals and approach of the draft directive and the relative abundance of costs data available on the U.S. system make it a good starting point for the cost impact assessment of the draft directive. However there are also significant differences between the U.S. approach and the draft directive'. These differences will undoubtedly result in a significantly different cost impact for the draft directive.

In the sections above we identified the costs associated with Superfund. In this section we start from those costs to derive the potential costs associated with the draft directive. We do this by singling out the differences between the U.S. system and the draft directive likely to have major cost impacts and assessing quantitatively or qualitatively the costs associated with these differences. In other words, we derive the potential costs²⁹ of the draft directive by subtracting from the costs with the actual Superfund the costs associated with Superfund features that make it more costly than the draft directive and adding the costs associated with the draft directive's features that are likely to make the latter more expensive.

The major differences identified concern retrospectiveness, exemptions or defences, the range of potential liable parties and the covered sources of damage. It is only possible to assess quantitatively the cost impact of the differences in retrospectiveness and even then only partially. The cost impact of the other major differences is identified qualitatively. The analysis below should be understood as an exercise that involves significant margins of uncertainty though it does allow an appreciation of the possible cost impact of the draft directive.

3.1 Retrospectiveness

²⁸ Some State authorities are the natural resource trustees in specific instances under the federal Superfund. In these cases they are the authorities who can claim damages from the responsible parties.

²⁹ Only direct cost impacts are assessed. Indirect cost impacts and welfare costs are not addressed.

One of the most important differences cost-wise is that Superfund is retrospective while the draft directive is not intended to be so. Superfund is retrospective in the sense that the courts have interpreted the Act as applying to events that may have happened before its adoption (1980). In concrete terms, this means that liability still attaches to contamination caused by hazardous substances released into the environment before 1980. In other words, waste may have been disposed of legally before the entry in force of Superfund but this does not necessarily release the generators, transporters, handlers, etc., of such waste from liability when such waste causes damage.

It is possible to estimate³⁰ what would Superfund cleanup costs be if there would be no liability for damage caused by wastes deposited before the adoption of the law (1980), i.e. the cleanup costs of a non-retrospective Superfund. For the moment being we assume that the draft directive would apply in a similar way to such a non-retrospective Superfund.

We start from the estimated cleanup costs of the 1134 federal Superfund sites known by 1994, i.e. 33 billion USD (1993 dollars). We then remove the cleanup costs³¹ with sites where all wastes were deposited before 1980.

But there are also straddle sites, i.e. sites where part of the wastes were deposited before 1980 and part after. It is quite often fairly difficult, sometimes impossible, to disentangle which wastes caused damage. We assumed here that only half of these sites would be covered under a non-retrospective Superfund and removed the cleanup costs of the other half from the total cleanup cost.

Private parties have proved more efficient in conducting cleanups than the federal authorities³². We assumed the same rate of comparative efficiency would apply in a non-retrospective Superfund and removed from the total cleanup cost a corresponding proportional amount.

Under these assumptions the cleanup cost of a non-retroactive federal Superfund would have been (based on the 1994 sites) of USD 8.8 billion (1993 USD), instead of 33 billion, i.e. around 1/3 of the retroactive Superfund.

We then applied the same weighting (31%) to the annual Superfund costs³³ for private parties and the federal authorities, converted the amounts in 2000 USD³⁴ and subsequently in €³⁵ and finally controlled for the difference between the US GDP and the EUR-15+12 Accession Countries GDP. We arrive at annual cleanup costs of 540

³⁰ The analysis that follows is essentially based on cost and site data from *Footing the Bill for Superfund (FTB)*, quoted above. See table on annex 1 for data on NPL sites by date of disposal of wastes and number of responsible parties.

³¹ FTB estimated an average site cleanup cost of 29.1 million USD for all sites in Superfund. We use this average cost.

³² FTB estimates the total cleanup cost of the 1994 Superfund (33 billion USD) would be reduced by 4.6 billion due to private parties' cleanup relative efficiency.

³³ Respectively 1559 million USD and 585 million USD (1993 USD). These were the remaining costs to clean the Superfund sites at 1994, assuming it would take ten years to clean them up and no more sites would be added to the NPL.

³⁴ Using the price deflator of private consumption.

³⁵ On the basis of an exchange rate of 1€=0.9USD.

million € (2000 prices) for private parties and 200 million € (2000 prices) for the public authorities (federal level), i.e. cost shares of roughly 75% and 25% for the private parties and the public authorities, respectively.

The EU draft directive coverage is broadly equivalent to the coverage of the U.S. federal and State Superfunds. Then we should add the cost impact of the State Superfunds to the federal one to arrive at an aggregate meaningful for our purposes. Based on the evidence available it is plausible to assume that the State Superfunds will double the impact of the federal Superfund. But this assumption rests on imprecise and fragmentary data and therefore we also admit that the State Superfunds may only increase the federal Superfund’ cost impact by half.

We worked also with the same proportion of transaction costs for private parties (21% of total cleanup+transaction costs) as in the federal Superfund. No account was taken of transaction costs for private parties in relation to State Superfunds due to lack of information.

We took the NRD costs with Superfund, assuming they amount to 8% of cleanup costs, and scaled them down proportionally to the reduction in cleanup costs due to non-retrospectiveness. In doing so, we accounted for the State-level Superfunds.

Finally, we also scaled down in the same way the administrative costs for the federal authorities³⁶, controlling for differences in GDP. No account was taken of State Superfund administrative costs due to lack of information.

We arrive at annual costs and this deserves to be qualified. The total cleanup costs of Superfund were estimated based on the assumption that all priority sites (as of 1994) would be cleaned over a 10-year period and no new sites would be added. Starting from that assumption, then the annual costs were derived. However experience has shown that new sites were added and that the 10-year cleanup horizon was not realistic. What emerges more clearly from the 30-year experience with Superfund is the resilience and the relative stability of annual costs over a long period. New contaminated sites have been added at a roughly constant and significant rate. Therefore, once we strip Superfund off of its retrospectiveness, as we did, it is more realistic to assume for the purposes of assessing our own directive that annual costs will only decrease after a long period (if at all). We therefore assumed the annual costs we derived would apply overtime.

Abstracting then from significant differences between Superfund and the EU draft directive, other than the Superfund’s retrospectiveness, the potential costs of the EU draft directive are indicated in the table below.

Baseline Annual Costs of the EU draft directive (million €, 2000 prices)		
Cleanup Competent Authorities (CA)	300-400	Depending on weight of MS-level damage
Cleanup Private Parties (PP)	540	No allowance made for State-level liability

³⁶ Though it is likely that this scaling down understates the administrative costs, a significant part of which should be fixed.

Total cleanup	840-940	See above CA
Bio-diversity damage	60-70	See above CA
Transaction costs, PP	140	
Administrative Costs CA	350	
Total costs	1400-1500	

These costs have wide margins of uncertainty attached to them, but they remain nevertheless the best estimate we could arrive at. One should not lose sight either that they abstract from the impact of the other major differences between Superfund and the draft directive whose cost impact cannot be quantified. These impacts are qualitatively discussed below.

Subject to the caveats above mentioned, the relative significance of costs with the draft directive can be usefully described with a few ratios. The directive cost should be below 1.5% of the total expenditure in the EU with environmental protection. It should also be below 0.02% of GDP. And as a measure of the personal effort required, it is enlightening to consider that the cost per person to cleanup contaminated sites and keep our bio-diversity in a favourable conservation status is lower than 4€ per person (3 if we factor in the population of the 12 Candidate Countries).

We will now discuss and identify qualitatively the impact of the other major differences between Superfund and the draft directive.

3.2 The transitional provisions of the draft directive

Superfund is fully retrospective, in the sense it applies to wastes³⁷ (hazardous substances) disposed of legally before its adoption. So far we assumed the draft directive would not be retrospective in the same sense, but this needs to be qualified in the light of the transitional provisions of the draft directive.

In practice the draft directive may indeed apply to wastes disposed of legally before its entry in force. What the directive states is that it will not apply to damage *the cause of which* occurred before its entry in force. Therefore, whether or not it will be retrospective (in the sense that it would apply to wastes disposed of before the date of implementation) depends of whether the cause of the damage will be interpreted as the disposal of waste or as the release of the hazardous substance³⁸.

If the cause of the damage will be interpreted as the release of the hazardous substance irrespective of the date when the waste was disposed of, then the directive will apply in many instances to damage caused by waste deposited in compliance with all applicable requirements before the entry in force of the directive. Indeed in many cases there are long lags between the deposit of the waste and ‘actual damage’ caused by the waste. Therefore, were the cause of damage to be interpreted as the release of

³⁷ The bulk of Superfund costs are associated with waste disposal.

³⁸ Also, equating cause of damage with date of release of an hazardous substance may also be the source of significant legal costs given uncertainties inherent in determining precisely the dates of actual releases.

the hazardous substance, the costs with the draft directive will rise and become a larger share of Superfund's than we assumed.

3.2 Specific exemptions from liability

Superfund exempts from liability damage which was identified by ex-ante environmental impact statements and explicitly accepted by the public authorities. It also exempts damage caused by permitted releases (of hazardous substances) and by registered pesticides.

The draft directive allows for comparable exemptions for NRD in connection with the Habitats Directive and also in the context of water contamination but not in other cases (e.g. soil contamination outside Natura 2000 areas)³⁹.

It is unclear what impact this difference vis-à-vis Superfund will have on the cost of the draft directive. Presumably more damage will be covered under the draft directive than under Superfund, with correspondingly higher cleanup costs, but it is not possible to quantify this cost difference.

Perhaps more importantly permits for specific releases and/or specified activities, and compliance with them, will provide in the EU less of a safety net for economic operators than in the U.S. This may lead to over-investments in prevention, or to avoidance of otherwise socially beneficial activities, particularly in areas where the environmental risk is perceived as high. Though this may result in a cleaner environment it is uncertain that it will also result in a net welfare benefit.

3.3 Potentially liable parties

Superfund casts a wide liability net, ranging from the generators to the transporters to the various parties involved in handling hazardous substances. Under the draft directive only the relevant operators of the activity causing the damage can be held liable. The draft directive provisions may conceivably be widely interpreted but it is unlikely that such interpretation margin will make the directive's liability net as wide as the liability net imposed by Superfund.

This is likely to reduce the private parties' share of the costs of the regime vis-à-vis Superfund, but not the overall costs of the regime itself since the Member States are under the obligation of restoring the environment even if no liable party can be found.

3.4 Covered sources of damage

Superfund covers damage caused by the release of hazardous substances. The draft directive covers damage caused by activities which are considered to pose significant environmental risks. The latter approach is wider. For instance, it covers noise damage or damage associated with economic activity even without releases of

³⁹ Though this not applies to 'registered' pesticides.

hazardous substances. It also covers GMO-related damage which is not covered by Superfund.

Consequently the draft directive may cover environmental damage in a wider sense and have thus higher costs associated with higher environmental protection levels. It is not possible to say at this point in time whether the associated costs will be significant or not.

3.5 But not all the draft directive's costs are new, additional costs

Finally, we have assumed until now that all the costs stemming from the draft directive would be additional costs for Member States and the private parties. This, of course, is only a simplification useful for analytical purposes but not entirely realistic.

Likely, most if not all NRD costs stemming from the directive will be new costs. Liability for NRD is essentially a new thing. However, as indicated before the share of NRD costs in the overall costs raised by the directive is likely to be small, below 10%. Most of the draft directive's costs should be associated with the cleanup of contaminated sites, an area where most Member States already have liability laws in place. Therefore not all the draft directive' cleanup costs will be incremental.

However, it is not possible to quantify which part will. First, data on cleanup-related costs in Member States is remarkably scarce. Existing indications thus suggest that cleanup costs associated with environmental liability are not very significant, at least in many Member States.

But perhaps more importantly the coverage and depth of Member States' liability legislation varies significantly. Moreover, this legislation often exempts from liability pollution 'tolerable under local circumstances' or 'pollution resulting from normal operation in conformity with existing legal requirements' though the legal underlying mechanism and formulation vary. In many instances too liability only attaches explicitly for damage to private property or personal injury rather than to environmental damage as such. Finally, existing legislation does not normally constrains Member States to cleanup even when no private responsible party can be found or is able to pay.

All these circumstances do suggest that while not all the draft directive' costs will be additional costs for Member States and private parties, a significant part will.

ANNEX 1

NPL sites by date of disposal of wastes and number of responsible parties, 1994							
	Multiparty sites		Single-party sites		Orphan sites		Total
	N°	%	N°	%	N°	%	
Pre-80 wastes	374	43	77	43	36	43	
Post-80 wastes	44	5	9	5	4	5	
Straddle wastes	453	52	93	52	44	52	
Total	871	100	179	100	84		1134
Based on information in Appendix B, "Footing the Bill for Superfund", K. Probst, RFF 1995							
Excludes federal government sites							