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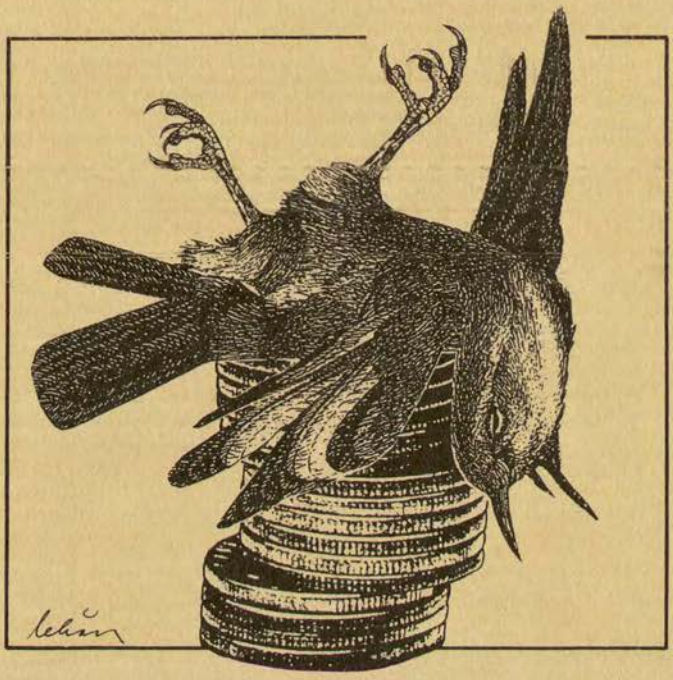

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Swedish Environmental Debt

A report from the Swedish Advisory Council
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THE ENVIRONMENTAL DEBT

A report on how the environmental debt develops if we do nothing

Arne Jernelöv

Translated by Ulla Edenmark, IVL

TABLE OF CONTENTS

FOREWORD

For too long the environment has remained a given condition, noticed only when environmental damage has become a fact, as when the acidification struck our forests or when a nuclear disaster transformed a humane environment into a poisoned ghost town.

Everything valuable has a price. The question is not *if* we will have to pay when the environment is damaged, but *when, how* and *who* will be forced to pay.

The connection between economy and ecology must be made clear through an increased use of effective economical incentives. By putting a price on the environment, the costs are made visible, and then future environmental debts can be avoided.

In this report, Arne Jernelöv has given a valuable assessment for a continued discussion around the connection between economy and ecology. He asks, "How does the environmental debt develop if we do nothing?". The truth is that it is already late to do something about the environmental situation. We must now see the problem in its entirety.

Olof Johansson

Minister of the Environment and Natural Resources and chairman of the Environmental Advisory Council

SUMMARY

Sweden's environmental debt is estimated to be approximately 260 billion SEK. The corresponding figure in 1980 is approximated to be less than half this in fixed monetary value. The heaviest items in the environmental debt of 1990 are within agriculture, waste and acidification areas. Based on the scenarios briefly dealt with in this report, Sweden's environmental debt is expected to increase with almost 7 billion SEK per year. The items causing increasing concern if "we do not act" are climate/variability, agriculture, waste and acidification.

The table below summarises the estimates.

Sweden's environmental debt (billion SEK, monetary value of 1990)

Area	*1990*	Δ *year*
Global		
Ozone in the stratosphere	-	-
Climate	85	2,5
Territorial		
Acidification		
Ground	36	0,4
Surface water	10	0,1
Ground water	1	0,3
Agricultural land		
Cadmium	6	0,1
Humus	25	1,3
Marine eutrophication		
Sea	10	±0
Coastal wetlands	0,2	±0
Chlorinated organic substances		
PCB etc.	0,1	±0
Seal sanctuaries	0,2	±0

Waste		
Environmentally hazardous	15	1
Domestic	15	0,1
Industry + other	18	0,3
Radioactive	35	0,5
Biological diversity		
Noah's ark	2,6	±0
Wetlands	2	±0
Total	261	6,6

INTERNATIONAL COMPARISON

The figure for Sweden - 300 billion SEK - can be compared to estimates made for the former DDR - 1 500 billion SEK, for Poland 2 000 billion SEK and the outflow area of the Baltic Sea 3 000 billion SEK.

These estimates only concern landfills and highly contaminated ground where decontamination costs are estimated to 10 000 DM per m^2.

The environmental debt for 3 000 dumping sites for hazardous waste in the USA is estimated to be 600 billion SEK and for the radioactive waste from the American military and nuclear power plants, 1 000 billion SEK. In addition, the required protection measures for the low-lying coastal areas of the USA, in the event of a rise in sea level related to a change in the climate, is estimated to 3 000 billion SEK. EPA's estimate of the costs for taking care of super-fund sites takes into consideration the type and degree of pollution as well as it's volume. The cleaning costs per ton vary between $500 and $10 000. In a completely different comparison it can be said that the estimated environmental debt in all cases, regardless of separate definitions and calculating methods, is considerably larger than the country's foreign debt.

WHO IS GUILTY?

Of the continually increasing Swedish environmental debt, approximately half is caused by activities outside of Sweden.

INTRODUCTION

A key concept in this report is environmental debt. This is defined as the cost required to restore environmental damage which is economically and technically restorable, as well as the size of the capital required for recurring restoration measures.

The report aims at showing how this environmental debt develops if actions already decided upon are carried out, but no additional measures or actions follow. The time perspective is approximately 30 years.

Naturally, this kind of study meets with a number of difficult limitation problems. The first and maybe the most important question is what we consider as restorable. The fewer items included, the smaller the environmental debt becomes. Do we mean restorable with today's technology or tomorrow's? Are we technical optimists or pessimists? It is easy to point out practical examples where these fundamental questions are brought to a head. Can an extinct species be restored? Do we count on the identification of mammoth's genes from preserved tissue, gene synthesis, implantation in an elephant egg instead of the original, and the subsequent development in the elephant mother resulting in a new-born mammoth? In which case what is the cost?

In this report, this type of restoration is considered as science-fiction and is not considered as environmental debt.

The principal question and the limitation problems remain. New technical achievements can increase the technical and economical possibilities for restoration but these can increase the environmental debt accounted for, since certain environmental damage, which earlier was excluded from the "debt" as it was considered impracticable, now can be included. In principle, this is not

unlike a situation where new mining and prospecting techniques result in "new" mineral findings suddenly being accounted for and listed as assets in the balance books of companies and in the accounts for national natural resources. Of the same type, but more trivial, is where a technical development can result in a restoration, included in the environmental debt, becomes less expensive and that the debt is thereby reduced. Investments on research and development within the field of environmental clean-up operations would probably reduce the environmental debt with more than the costs for the research and development.

Questions where the formal answer could differ from the real are: When has a decision been made? Is an international agreement a decision? Is a government agreement of an all-embracing character, for example limits on carbon dioxide emissions, a decision? Does the introduction of a new technique at a plant imply a decision to introduce it everywhere on the basis that "the technically possible and economically reasonable" is a superior policy? In this report, a pragmatic point of view is adapted. This means that the future is based on the author's assessment of what happens if the politicians do not change the rules of the game, i. e. decisions already made, and if the administrators do not change the application of the rules. Consequently, for different cases in the future, an assessment of what is a decision is necessary.

Another key question carrying difficult consideration problems is "Restoring to what situation?". Examples from forestry and agriculture can illustrate this problem. Today's forestry and agriculture lead to a culture landscape with much fewer species than that during the early twentieth century. Do we want to restore the situation to that fifty, a hundred or three hundred years ago, or is it the vast oak forests from the time of the Roman Empire that is the dream of Germany and southern Scandinavia? The answer, which again refers to the practical handling in this report, is that no time limit has been identified, but instead the need for restoration is quantified with regard to sustainable yield for cultivated areas and the diversity of species. In addition, the concept of sustainability has been given the criteria that built-up deposits of nutrients/environmental toxins are to be rendered harmless by immobilisation or destruction.

The degree of restoration is also of decisive importance for the clean-up operation costs. In Sweden, the restoration target is more demanding for radioactivity than for chemicals. Consequently, the industrial hygiene limits for radiation-induced cancer are regarded as ten times the importance as cancer caused by chemicals. In this report, the clean-up costs for nuclear waste in the year 2020 is estimated to be 50 billion SEK while the costs for all other toxic wastes is estimated to be 95 billion. If the demands for restoration in relation to toxicity or mutagenic effects were as severe as for the nuclear waste, the costs would be at least five times greater.

On the other hand, if the degree of restoration for nuclear waste was as low as for chemical waste, 10 billion SEK would be sufficient.

HOW ARE RESTORATION COSTS ESTIMATED?

The cost estimates presented are of very different precision. In some cases, treatment costs of a specific clean-up operation and the number of operations carried out are reasonably well known. In other cases, restoration cost per object as well as the number of objects are roughly estimated. The level of precision is thus limited and can be loosely expressed as: "The right amount of zero's and one significant digit".

A more principal question pertains to how restoration measures of limited durability are compared to the final treatment. Examples can be found in the acidification area where the liming of lakes can be characterised as only a temporary defence. The cost calculation technique applied here is based on an estimate of the restoration cost per year, whereafter the environmental debt is stated as the capital generating the interest covering the yearly restoration cost. In the report, an interest rate of 5% is used.

In the calculation of Sweden's environmental debt, a separation has been made between global and territorial environmental problems. In the first category, the debt is assumed as being the debt of the "rich" and for Sweden's share to correspond to our share of the world's rich population (8,5 million

out of 1 billion) without consideration of the fact that our net contribution is considerably smaller.

In the second category - the territorial - the environmental debt is considered as belonging to Sweden in spite of which country is responsible for the emissions causing the damage.

GLOBAL ENVIRONMENTAL PROBLEMS

Global environmental problems include ozone depletion in the stratosphere and UV-radiation together with greenhouse gases and climate effects. These global environmental problems are in this context regarded as the responsibility of the "rich world". The environmental debt is therefore calculated as that distributed among one billion people of which 8,5 million live in Sweden.

STRATOSPHERIC OZONE

No technique is available for replacing the ozone layer and therefore no environmental debt is calculated.

CLIMATE

An indisputable fact is that the concentrations of certain gases such as CO_2, CH_4 and N_2O and CFC in the atmosphere is increasing, and that these gases inhibit the heat radiation from the earth.

The best calculations of today, which although lack potentially important physical and biological feedback-mechanisms of positive and negative character, indicate that the global average temperature might increase with 3-4 °C if the concentration increases continue during the next few decades. In which case, the polar temperature will probably increase twice as much (6-8° C).

Today's knowledge is insufficient to make regional and national prognoses, but the primary economical effects in Sweden, for example to the energy balance, forestry and agriculture, from a rise in the yearly average temperature of about 5 °C, would not necessarily be negative.

On a global scale, a change in the climate could result in negative effects on the water balance in the interior areas of the continents - today's surplus areas for corn and maize - and large costs for relocation. Estimates - bordering on guesses - of the number of environmental refugees point toward half a billion. How this could affect Sweden is not possible to predict, but the costs would probably be very high.

Sweden's contribution to the increase in greenhouse gases is small. There is currently more of the most important gas - carbon dioxide - fixated within Swedish territory than is emitted. The following illustrates the current situation.

Carbon dioxide from Sweden to the atmosphere	*(Mtons C/year)*
Combustion of imported fossil fuel	16 (15-17,5)
Limestone calcination	0,8
Loss from agricultural land	1,6 (1,0-2,2)
Loss from forest land	0 ((-4)-4)
Total	18,4

Carbon dioxide from the atmosphere to Sweden	*(Mtons C/Year)*
Net increase forest biomass	9 (7-11)
Export forestry products	5
Net increase peat	1,2 (0,4 - 2,6)
Net sedimentation lakes	1,5 (0,4 - 2,9)
Carbon sedimentation from run-off water at coastal areas	1,3 (0,9 - 1,7)
Net sedimentation of primary products in Swedish territorial waters	7 (5-10)
Accumulation technosphere (for example building)	0,3 (0,1 - 0,5)
Accumulation waste deposits	0,4 (0,3 - 0,5)
Total	25,7

Net fixation in Sweden 7,3 Mtons C/year

The global anthropogenic CO_2-emissions amount to approximately 6 billion tons (as C) per year. The increase in the atmosphere is approximately 3 billion tons. Carbon dioxide is responsible for about half of the anthropogenic greenhouse effect.

The increase to the atmosphere is, up to now, equal to approximately 100 billion ton CO_2 (as C).

There are technical solutions for separating CO_2 from air and thereby - in principle - restoring the CO_2 concentration and natural greenhouse abilities of

the atmosphere. In all respects, these technical gas separation methods are much more expensive (10-100 times) than fixating the corresponding amount of carbon in biomass/ground carbon. Different calculations have shown that considerable amounts of carbon can be bound in biomass and as ground carbon at a cost of $5-10 per ton. The bindable amount certainly increases if a higher price is accepted. In the following example, a cost of 100 SEK per ton carbon is assumed.

Today's environmental debt: 100 billion ton x 100 SEK = 10 000 billion SEK.

Yearly increase 3 billion ton x 100 SEK = 300 billion SEK.

Sweden's share (0,85%) of the current environmental debt up to the present then becomes 85 billion SEK with a yearly increase of 2.5 billion.

TERRITORIAL ENVIRONMENTAL PROBLEMS

ACIDIFICATION - SOIL, SURFACE AND GROUND WATER

The situation in 1990

Today more than 10 000 of Sweden's 80 000 lakes are heavily acidified due to acid rain, and an additional 10 000 are loosing their ability to buffer, risking the same fate. Moreover, there is obvious acidification damage in approximately 100 000 km of running water.

The ongoing lake liming program is a continuing defence, allowing species sensitive to acidification to survive in lakes and streams from which they otherwise would have disappeared. So far, more than 5 500 lakes have been limed. The yearly cost for the public treasury amounts to 100 million SEK, but if work and other voluntary efforts were counted at market value, the total cost would amount to more than twice as much. The current extent of the liming program for lakes and streams is estimated as equalling almost half of what is needed to counteract all the water acidification problems - i. e., the cost for full scale liming of surface waters is currently estimated to 500 million SEK per year. The environmental debt - here in the form of the capital needed for an interest of 5% to cover the yearly cost - would be 10 billion SEK.

The ground water is, as yet, only acidified in a limited number of sensitive areas, but decreasing buffering ability in soil and ground layers may lead to a rapid increase in the extent of the affected areas if no counter-measures are initiated.

Direct liming measures to counteract acidification of ground water are technically difficult to carry out. Water from individual wells can certainly be limed, and also limestone linings around wells in areas with acidified ground water can be used. The current need for ground water liming is estimated to be a tenth of the need for surface water liming, i. e. to 50 million per year corresponding to an environmental debt of 1 billion SEK.

The pH value of forest land has declined alarmingly in large parts of southern Sweden and certain central parts, for example Dalsland - Värmland. Current estimates seem to indicate that 650 000 hectares of forest land is in need of liming/vitality fertilizing for the production ability of the forest to be maintained and the continuing ground acidification countered. The cost for such a program is estimated to between 3 and 4 billion SEK over a period of ten to fifteen years.

Forest liming/vitality fertilizing, according to this model, supplies the forest soil with a buffering layer on the surface, which counteracts further acidification of the ground following acid rain. However, it does not restore, except possibly over a long time period, the pH and ion balance of the soil. Direct measures to do this would be ten times as expensive than the suggested surface ground liming program, i. e. perhaps as much as 30 billion SEK, if it is at all possible.

The current environmental debt based on the costs for restoring the pH and ion balance in forest land can be estimated to amount to 30 billion SEK. The cost for a continuing defence is estimated to 3-4 billion SEK with a duration of ten to fifteen years, that is a yearly cost of approximately 300 million SEK. The environmental debt in form of the allocated capital needed to make this possible is 6 billion SEK and the total consequently 36 billion SEK.

Trends

In spite of heavy reductions of sulphur emissions in Sweden and significant reductions in other countries in western Europe, the deposition in southern Sweden up to 1989 has only marginally been reduced. The development in eastern Europe up to the big political changes a couple of years ago, counteracted the positive contributions from the west.

The estimates of "what nature can take" seem to suggest that the deposition of acidifying substances should be reduced by 80% in the most exposed parts of the country for the acidifying process to cease. Current international agreements in the environment field will not even come close to achieving this result. The acidification therefore will continue and, with a gradual exhaustion of the buffering capacity of the soil, future decreasing deposition could even give increased acidification problems in the form of a lowered pH in ground water.

The development in eastern Europe - above all in the Baltic states - plays a key role in the continuing acidification in Sweden with regard to emissions of SO_2 and NO_x. Preliminary estimates based on the development of industrial production indicate that sulphur emissions in 1990 and 1991 have been reduced with as much as 40%. However, this has nothing to do with environmental commitments but is an effect of the fact that the strongly polluting, lignite-using heavy industry in eastern Germany, Poland and Czechoslovakia has been forced to reduce or close down production due to international market competition.

What is going to happen in the next few decades is almost impossible to predict. A guess is that the sulphur emissions from the industry succeeding the present can be contained at a level of 50% of the sulphur emission level of 1989, while the emissions of nitrogen oxides from an increasing use of private cars will increase.

In this scenario, the number of lakes heavily acidified or in need of continued protective liming increases from today's 10 000 to maybe 15 000 in thirty years time. The cost for surface water liming in the monetary value of 1990 would then amount to 700 million SEK per year. The corresponding cost to buffer acidified ground water would increase a lot faster; a cautious estimate suggests an increase of ten times today's level to 500 million SEK per year. The environmental debt for acidified surface water has thus grown to 14 billion SEK and that of acidified ground water to 10 billion SEK. The area of acidified and/or nitrogen-supersaturated forest land can have increased to almost one million hectares, and the yearly cost for the continuing defence in the form of surface liming of the forest land to 400

million SEK. The capital needed to support this continuous defence would be 8 billion SEK. The environmental debt for restoring the pH and ion balance of the soil is estimated to increase to 40 billion SEK in today's monetary value because of the increase in actual area. The total capital for continuous defence and restoration of the pH-value and ion balance of the soil thus becomes 48 billion SEK.

THE CADMIUM AND HUMIC CONTENT OF AGRICULTURAL LAND

Cadmium

The content of cadmium in agricultural land is increasing continuously due to cadmium-contaminated phosphate in artificial fertilizers as well as cadmium-contaminated sludge from communal sewage treatment plants. Air deposition is also a contributor. The increase rate is estimated to be 0,5% per year.

The mobility of cadmium in soil is to a high degree dependent on the pH-value of the soil. If liming of agricultural land becomes insufficient to preserve high pH-values in the future, the cadmium uptake of plants could increase drastically, increasing the consumer's intake with it. As the normal exposure for a greater part of Sweden's population today lies within a factor 2 or 3 of effect levels, an increase in the cadmium content of basic foods represents a threat to human health. The development observed in forests already shows clear warning signals. In many parts of the country where the acidification is advanced, for example Småland and Värmland, the cadmium content of the moose's liver and kidneys is such that those organs should not be eaten. It might also be possible that the surprisingly high cadmium emissions from the forest industry which have been observed lately are the result of a higher concentration of cadmium in the wood. A technique for reducing the content of cadmium in the soil is currently not available.

The preservation of a high pH-value in agricultural land is therefore a condition for acceptable contents of cadmium in food.

The use of lime in agriculture and horticulture has decreased from ~350 thousand tons per year in the beginning if the 1980's to 184 thousand tons in 1990. A reversal to lime dosages of ≥300 thousand tons per year will probably be necessary to, among other things, retain a low cadmium content in crops.

Approximately 500 million SEK per year can provide a continuing defence and this corresponds to an environmental debt of 10 billion SEK. The current yearly cost and environmental debt however, is estimated to be 300 million and 6 billion SEK respectively.

Humus

Since the late 1940s, the content of humus in Swedish agricultural land has decreased continuously as a result of the agricultural technology currently used in Sweden and other western countries. A lower humus content in soil implies a reduced ability to bind water and nutrients which results in an increased sensitivity of the crops to, for instance, variations in weather. In the long perspective, the humus content of agricultural land could be restored through transition to other kinds of technology (for instance reverting to traditional methods). To do this within the frame of a direct restoration program is technically possible but expensive. The following example illustrates this.

Estimated total loss of organic substances from agricultural land since 1950 : 20 Mtons (as carbon).

Amount agricultural land:		2,8 million hectare
Humus loss (as carbon)	per hectare	7 tons
	per m^3	0,7 kg

The restoration of humus content could be carried out by, for instance, adding peat, which in one calculation example would cost approximately 90 billion SEK.

However, the required magnitude of peat cutting would in itself give rise to environmental damage and a new environmental debt.

An alternative calculation example is based on the producing crop being used to increase the humus content of the soil, for instance, through plowing in or *in situ* composting.

The average crop production of one hectare of agricultural land corresponds to 1-3 tons of carbon in humified form.

Consequently, 3-4 years of production would have to be directly returned to the soil in order to compensate for the estimated humus loss of the last forty years.

Of the 30 billion SEK production value of agriculture, half is supposed to originate directly or indirectly from crops. (The rest is assumed to be animal production from feeding grain). The environmental debt would then amount to approximately 50 billion SEK.

However, if the explicit purpose of the production was to restore the content of ground carbon, it should be possible to significantly reduce the cost to reach this specific goal. A cut in half seems entirely possible. A revised environmental debt is consequently 25 billion SEK.

Since current agriculture technology is several decades old, the majority of cultivated soils have reached a kind of balance regarding the content of organic carbon. Significant exceptions are the cultivated areas obtained by drainage of wetlands. The carbon loss in these areas are estimated to be 1,6 million tons per year, but this is expected to decline during the following decades.

If the average yearly loss up to the year 2020 is approximated to 1 million ton carbon per year, the restoration cost as above would increase with 1,3 million SEK per year.

MARINE EUTROPHICATION

The situation in 1990

In a marine environment, nitrogen in the form of nitrate or ammonium is the foremost factor for limiting production and therefore the most important reason for eutrophication. The following tables show the nitrogen emissions stated by the respective authorities of the countries bordering the Baltic Sea and the Skagerrak and Kattegat seas as well as estimates of deposition and nitrogen fixation over and in the respective sea area. The amount for Germany is the total of the former DDR and BRD. The stated values from the eastern coastal states of the Baltic Sea are probably too low and other independent estimates put the total 30-60% higher.

Nitrogen load to the Baltic Sea

Country	*thousand tons N/year*
Sweden	100
Finland	70
Poland	110
Russia	130
Germany	20
Denmark	50
Atmospheric deposition	370
N-fixation	130
Total	980

Nitrogen load to the Skagerrak/Kattegat seas

Country	*thousand tons N/year*
Sweden	40
Denmark	20
Norway	45
Atmospheric deposition	60
Total	165

In addition, the load from sea currents, for example, the currents flowing on the eastern coast of Jutland (Denmark) from the North Sea and the Baltic Sea needs to be included.

The load of nitrogen is approximately five times as high as the pre-industrial era, and the load of phosphorous almost ten times as high. The primary production has greatly increased. The larger amount of phytoplankton results in increased turbidity and reduced visibility depth, forming a basis for a larger population of zoo plankton and benthic organisms to establish. Considerably larger quantities of organic material, to a large extent consisting of dead algae, falls through the thermocline and down into the stagnant bottom water. The oxygen depletion has increased and lack of oxygen is currently appearing over large bottom areas in the Baltic Sea, 2,5 - 3 years after an intrusion of salt-water.

Reduced light from turbidity caused by phytoplankton and increasing competition from periphyton have decreased the litteral zone dominated by kelp. As a consequence, organisms like shrimp have decreased in numbers, while periphyton and stickleback have increased.

The total fishing activities has also greatly increased from a couple of hundred thousand tons/year to about a million.

From a "user's point of view", there are above all two aspects of marine eutrophication that are particularly interesting: recreation and fishing. From a recreational point of view, a sea with clear water, a thriving sea bed and rocks with kelp instead of slimy green algae is of course to prefer and "worth more". From a fishing point of view, the ideal would be a good and regular access to valuable fish. Although the supply of fish is increasing with eutrophication, the variation in catch, especially of cod, between good and bad years is also increasing. As a resulting effect of the larger food supply available for fish, the salmon's flesh turns grey-white instead of pink and the market value goes down. Most often the change in species in the wake of eutrophication means that less appreciated and therefore cheaper consumption fish constitute a larger share of the increased catch.

Trends

The nitrogen is mainly supplied in two ways - via the atmosphere and via run-off from agriculture and forestry.

The deposited atmospheric nitrogen compounds arise from combustion (NO_X from traffic and energy production) and the use of organic fertilizers (ammonia).

The trend so far in the areas affecting the Baltic Sea, the Skagerrak and the Kattegat is that run-off water from land has stagnated at a high level while the load nitrogen from the atmosphere has continued to increase.

Decisions on the (limited) use of catalytic exhaust systems on gasoline-fuelled cars in Western Europe will lead to a decrease of the NO_x emissions from traffic despite increases in the car population. Increased use of private cars in Eastern Europe will lead however, to increased traffic emissions. Government decisions and technical development are expected to lead to the introduction of low-NO_2 burners on large and medium fossil fuel boilers all over Europe.

A better use of organic fertilizers in countries like Denmark and the Netherlands could lead to lower ammonia emissions from agriculture in Western Europe, while the introduction of modern intensive livestock management could lead to increased emissions of agricultural ammonia in for example Poland and the former DDR.

An evaluation of the trends up to now and an assessment of the technical-economical development seems to suggest that a certain continued increase of the nitrogen load is expected.

The effect of this will be a continuing eutrophication, faster oxygen depletion at the sea bed following an intrusion of salt-water and an even larger average spreading of the oxygen-free bottoms. In addition, increased turbidity caused by algae, regular episodes of algae blooms, the disappearance of kelp as the dominating plant of coastal areas and sporadically good cod fishing can be forecasted.

An increased run-off of nitrogen from acidified and nitrogen-saturated forest land is also a contributing factor.

Although the phosphorous load is expected to continue to decrease slowly, this is believed to be of small consequence for marine eutrophication.

The slow exchange rate of the Baltic Sea (~30 years) contributes by making the system sluggish.

A rise in the sea level following a change in climate could possibly contribute to more frequent salt-water intrusions in the Baltic Sea and thereby improving oxygen conditions at the sea bed. This would then entail a decreased recirculation (internal fertilizing) with phosphorous.

The changes at the Swedish west coast should be less extensive than those to the east bordering the Baltic Sea. The effect of action against nitrogen emissions from primarily traffic and agriculture in Sweden, Denmark and Germany will give a reduced nitrogen load while nitrogen saturation in Swedish and Norwegian forests leads to an increased run-off via forest streams.

A restoration of the Baltic sea has never been directly discussed and would be of doubtful value as long as the eutrophicating emissions continue. In a hypothetical situation where the emissions are reduced considerably, the long residence times and the internal self-fertilizing processes would delay the recovery for maybe centuries, and only then can the question become interesting. From small lakes we have restoration experience from bottom dredging, oxygen addition techniques and dispersion of nutritive salts which in principle could become possible techniques for the Baltic Sea as well.

Under the waste heading, estimated costs are accounted for regarding restoration of approximately 500 eutrophicated lakes and streams extending over a total area of almost 10 000 hectares. The average cost is then 200 000 SEK/hectare with a range from 5 000 to 1 million per hectare depending on the degree of clean-up and the method for restoration. In one example from the Baltic Sea, 3 million hectares could benefit from restoration measures due to eutrophication. If only the least expensive methods per surface area are

possible and an average cost of 10 000 SEK per hectare is set aside, the total cost would be 30 billion SEK of which Sweden's share roughly calculated would be 10 billion SEK.

In connection with the mechanisation and rationalisation of agriculture, wetlands have been ditched and biotopes with high diversity have been destroyed. These wetlands and especially the ones close to the coast were effective nitrogen traps and provided protection for the marine environment against both eutrophication and pollution by persistent substances such as metals. In many cases, the wetlands also were important nesting habitats for birds. Strong environmental reasons speak for restoring some of these - together maybe 20 000 hectares - at a cost of 10 000 SEK per hectare, that is in total 200 million SEK.

It should be noted here that Sweden's declaration together with 11 other countries to reduce nitrogen oxide emissions with 30% is not regarded as a decision. Moreover, the declarations from Sweden and other countries within the frame of the so-called North Sea conference regarding a reduction of nitrogen of 50% are not considered as decisions.

The future scenario discussed here has been proposed based on other nitrogen load assumptions, which is made clear in the text.

The uncertainty of the cost estimate is so great that it, until further notice, is valid also for the hypothetical situation in the year 2020.

CHLORINATED ORGANIC COMPOUNDS

Situation 1990 and trends up to now

The chlorinated organic compound group includes classical environmental toxins such as DDT and PCB, "new" like CFC and a large group of substances whose effects are poorly understood or substances that are not individually identified. In fats from aquatic organisms, >90% often consists of the organically bound chlorine of unidentified substances. Certain indications point towards the fats which are chlorinated - that the organisms themselves in the fat synthesis build in low-molecular chlorinated compounds.

In the Swedish perspective, the classical environmental toxins are of most concern regarding the Baltic Sea. The contents of DDT and their metabolites in fish and sea birds have decreased to approximately 10% of that in the beginning of the 1970s. By the end of the 1980s, however, the decrease had altered and DDT contents started to increase. The reason is long-distance transport from the south, from among other things the cotton plantations of Egypt.

In connection with decreasing DDT (or rather DDE) contents, the thickness of egg shells of fish-eating birds increased and the reproduction disturbances ceased. There is a certain - but not impending - risk that the contents of DDT and their metabolites are again increasing in organisms in the Baltic Sea to levels where thin eggshells again will be a threat to bird population. (This risk is of course much larger closer to the area of using DDT based pesticides).

PCB-contents are fairly well correlated with disturbances in the immune defence and reproduction of Baltic Sea seal. The contents of PCB in organisms from the Baltic Sea have decreased by approximately 50% during the last two decades. This is partly due to terminated industrial activities and reduced emissions, but a contributing reason for the decrease can also be eutrophication and increased biomass. A certain amount of PCB is distributed to a larger amount of organisms and results in lower overall content in the biomass.

The situation for the seals has, unlike the situation for fish-eating birds, not improved as a result of the reduced PCB content in fish and other organisms of the Baltic Sea. During the last two years there has been a positive indication however, and the National Museum's investigations show that the decrease in the Swedish grey seal population in the Baltic Sea and the Gulf of Bothnia is being halted. Finnish investigations of the fertility of ringed seal females in the Gulf of Bothnia also point toward a certain improvement since the middle of the 1970s. If this is a turning point or if it is just a notch in the catastrophe curve remains to be seen. Two factors contribute to the possible increase in the actuality of the PCB issue.

1. Dioxins represent a group of environmental toxins that have received a lot of attention during the 1980s. The total effect of the dioxins are evaluated through conversion to so called TCDD-equivalents. It has been suggested that the seal's problems could be caused by dioxins and not PCB. Some evidence however, does not entirely support this theory, for example, seals from the Swedish west coast and Spitsbergen have approximately as high dioxin contents as the seals in the Baltic Sea, without experiencing the corresponding effects.

However, estimates that have been made recently show that certain PCB - the so called planar compounds - contribute to more TCDD-equivalents than the dioxins as a result of much higher concentrations.

2. In connection with the Soviet disarmament, a large number of tanks and other military tracked vehicles will be dismantled (several 10 000). These contain a relatively large amount of hydraulic oil which in order to avoid ignition under fire or leakage often contains PCB compounds. A careless handling of the hydraulic oil could entail a PCB catastrophe for the Baltic Sea and others.

Analyses of collective parameters such as AOX or EOCl, which represent the amount of organically bound chlorine, have not been used long enough for any trends to be determined.

The emissions of chlorinated organic compounds are mainly in the form of by-products from pulp bleaching and waste water from the pulp and paper industry and also emissions of organic solvents to air.

The emissions of chlorinated organic substances as AOX from the Swedish pulp and paper industry in 1988 amounted to 13 000 tons, which would have constituted approximately 40% of the load to the Baltic Sea.

The Swedish emissions of chlorinated organic solvents in the same year amounted to 20 000 tons, and the emissions from OECD Europe are estimated to 600 000 tons. Uncertain estimates of usage within industries in Eastern Europe indicate a consumption of 200 000 tons chlorinated solvents, (here also measured as chlorine).

The Baltic Sea receives 5 000 tons chlorinated organic compounds (measured as AOX) per year, mainly from deposition via Swedish rivers. A rough estimate gives a total indirect deposition load via rivers of 20 000 tons and a direct deposition of 10 000 tons per year.

The deposition that is expected to reach the Baltic Sea, 30 000 tons, is therefore only 4% of that which in Europe is emitted to the atmosphere in the form of evaporating solvents.

The emissions from the pulp and paper industry have so far tended to decrease, and this trend is expected to continue. In addition, the Swedish emissions of chlorinated solvents are also expected to decrease due to programs involving the introduction of suitable non-chlorinated replacement solvents.

A corresponding, but maybe not quite as quick, decrease can be expected in OECD-Europe. In Eastern Europe, the modernisation of the economy could entail an initially increased use of chlorinated solvents. The load on the Baltic Sea is expected to decrease however, but based on the decisions made, only with 10-20%. The changes in (Eastern) Europe's industrial structure can easily initiate considerably larger changes.

Restoration measures regarding chlorinated compounds are possible only in a few cases where the spill of chlorinated organic substances such as PCB in the bottom sediment of lakes and streams can be prevented. The cost for identified measures of this kind in Sweden could be estimated to 100 million SEK.

One type of continuing defence could be seal sanctuaries where a reasonably large number (maybe 50-100) of individuals of the threatened Baltic Sea seals could be saved until the living conditions in the Baltic Sea have been restored. Such seal sanctuaries could be maintained at a yearly cost of 10 million SEK at a few places along the Swedish east coast. The estimated capital to cover the operation cost; 200 million SEK.

At present, the seal population is slightly increasing and so hopefully the need for seal sanctuaries will disappear in 30 years.

Waste

The term waste in this context pertains to products or by-products that have no positive value for the owner, who therefore is eager to get rid of them at the lowest possible price. The total quantity of waste generated in Sweden on a yearly basis amounts with this definition to almost 60 million tons. The figure includes an estimate of the quantity of soil, sediment etc. that through contamination by environmental toxins (over or under the often vague limit where it is officially regarded as hazardous waste) becomes waste itself.

In this report, waste is divided into four main groups: waste hazardous to the environment, domestic waste, industrial waste and nuclear waste.

Hazardous waste

A calculated composition of the waste classed as hazardous to the environment is shown in the table below:

Type of waste	*Generated amount (tons)/year*
Oil waste	180 000
Metal waste	120 000
Acid and alkali waste	70 000
Other	130 000
Total	500 000

According to available statistics, the amount of hazardous waste is increasing, but it is unlikely that the amount produced is increasing. Instead, an increasing number of waste types are accounted for as hazardous waste and join the statistics.

The treatment capacity of today is clearly insufficient and for certain wastes treatment resources are lacking completely. The following table shows a summary of today's situation.

Waste recipient	*Yearly amount (tons)*
Industry	150 000
SAKAB	40 000
Export	60 000
Storing and temporary deposition	150 000
Total	400 000
Unaccountable	100 000

Technical process improvements and innovations are expected to lead to a gradual decrease of the generated quantity of hazardous waste, but the rate of this trend is hard to estimate if today's conditions prevail. For a long time, it can be expected that the reduced quantity of produced hazardous waste will be more than compensated by a reduced "unaccountable" fraction from improvements in statistics.

Important statistical changes and modifications of demands on treatment resources can also come into focus following new definitions and limitations. If for example sludge from communal sewage treatment plants would be classed as hazardous waste, which has been suggested, the generated quantity per year would increase with 1,5 million tons to a total of 2 million tons.

The current environmental debt in the form of untreated, stored or temporarily deposited waste can be estimated to be 15 billion SEK, corresponding to 3 million tons and a cost for environmentally correct treatment and final storage of 5 000 SEK per ton.

SAKAB's average fee for treatment of hazardous waste currently amounts to 3 500 SEK per ton with a maximum for the most difficult to treat waste of 75 000 SEK per ton. The price estimate for treatment of Sweden's hazardous waste is based on the assumption that the untreated mountain of hazardous waste is somewhat more difficult to treat than the average of that which is treated by SAKAB today. The quantity estimate is based on an accumulated quantity of 20 years of storing and temporary deposition at today's level. The quantity of hazardous waste that is unaccountable by statistics (as in the table above) is not included. This unaccountable fraction presently constitutes 20%

of the total and previously was larger. Thus in total, this unaccountable quantity could also amount to at least 3 million tons.

Another way to illustrate the environmental debt in the form of hazardous waste is to base it on the number of landfills that have been classed as risk landfills by the Swedish Environmental Protection Agency. The number is 500. A treatment cost of 15 billion SEK would correspond to an average cost of 30 million per risk landfill for digging and treatment of the waste and contaminated soil. This does not seem to be an unreasonable price tag.

The yearly increase in the environmental debt is estimated to be 150 000 tons for stored and temporarily deposited waste, and 100 000 tons for unaccountable hazardous waste, with an average cost of 5 000 SEK per ton, which makes a total of just over one billion SEK per year.

Domestic waste

The generated quantity of domestic waste in Sweden each year is 2,5 million tons. The volume is increasing and a lack of deposition locations and capacity for treatment gives rise to a removal problem. The waste composition is also becoming increasingly complicated (see below under the chemical society) and thus technical and environmental problems during incineration or composting treatment are encountered. This leads to increased costs per treated unit of volume.

Waste sorting and the responsibility of manufacturers for the entire life cycle of the product are necessary for future waste handling. Deposit systems are mainly experimental and have no effect on the total volumes. The fact that the public has discovered that sorted waste is subsequently brought together again and that the main purpose of the operation was to study the inclination to accept sorting could make it difficult to regain confidence for a full-scale operation. The following table shows the types of recipients of domestic waste used during the past 20 years:

Form of recipient	*% of domestic waste*		
	1970	*1980*	*1987*
Landfilling	76	58	35

Composting	1	8	10
Incineration	23	34	55

If it is assumed that the amount of domestic waste has increased with 3% per year between 1970 and 1980, and with 2% per year thereafter, it is found that the deposited amount during the twenty-year period amounts to approximately 20 million tons.

Several thousand landfills around the country, including many closed, are emitting leachates and contaminating surface and ground water. The emission of methane gas, which contributes to the greenhouse effect, is also significant.

The cost for a total treatment of all old landfills, which can include digging up and moving, installation of bentonite walls, and leachate pumping, control of methane fermentation and gas collection, is roughly estimated to be 15 billion SEK.

This corresponds to an average of 5 million SEK in costs per landfill or 750 SEK per ton deposited domestic waste.

Today's deposition technique is undoubtedly better than yesterday's, but on the average far from perfect. Consequently, the continuing deposition of domestic waste is also expected to contribute to the environmental debt with a cost of 200 SEK per ton deposited, which currently comes to almost 200 million SEK per year.

Industrial and other waste

The total quantity of industrial waste produced each year in Sweden amounts to approximately 50 million tons. The largest posts are mining waste 28 million tons, forestry waste 8 million tons, construction and demolition waste 5 million tons, contaminated soil and sediment 6 million tons, food industry 3 million tons and iron and steel industry just over 1 million tons.

The accumulated amount of industry waste produced since 1950 is approximated to be 1 000 million tons.

Old industrial waste landfills almost never meet modern demands on environmentally correct deposition. The total volume of "unsuitably"

deposited waste of this kind can be estimated to around 100 million tons. Treatment of these large volumes of unsuitably deposited waste can include covering, protective walls for ground water, leachate pumping and in certain cases excavating. The environmental debt for treating these landfills is estimated to be 8 billion SEK or an average of 80 SEK per ton.

In addition, today's deposition of industrial waste is partly made on locations that are not environmentally suitable for final storage. The environmental debt taking care of this kind of waste is consequently growing - with approximately 300 million SEK per year, corresponding to 6 SEK per ton waste.

Apart from these assigned landfills there are even "unintentional landfills" or in other words locally limited areas heavily contaminated, but where treatment efforts are environmentally motivated and technically feasible. Some of these "historical environmental problems" have gained a great deal of attention. Through appropriate actions these sites are not getting worse, and virtually no leaking problems occur, but existing damages still remain.

The list below shows seven such examples with an approximated number of cases in Sweden and an estimated cost for restoration.

1. Fibre banks with mercury - approx. 50 — 1 000 Million SEK
2. Pentachlorine contaminated ground at sawmills - approx. 100 areas — 300 Million SEK
3. Creosote-contaminated streams at wood-impregnation plants - approx. 15 — 300 Million SEK
4. Bark-littered former timber storehouses at log-driving sites - approx. 100 — 100 Million SEK
5. Former grounds for gas works, chemical industry etc. - approx. 30 — 1 000 Million SEK
6. Waste dumps and slag heaps at former mining industries - approx. 30 — 300 Million SEK

7. Eutrophicated/overgrown lakes and streams - approx. 500 — 2 000 Million SEK

Total — 5 000 Million SEK

The listed examples constitute only a minor fraction of the remaining environmental problems, but all the same, the most talked-about, and investigated and maybe even "the most expensive to treat". The cost for restoring these amounts to 5 billion SEK. The total - that is the environmental debt for this kind of problem - is assumed to amount to 10 billion SEK. The "self healing" is slow - an average of <1% per year. The environmental debt therefore is assumed to increase along with the inflation.

The environmental debt in the form of treatment needs within waste areas is illustrated by estimates made by the Environment Protection Agency where 5 000 locations with contaminated industrial land and landfills requiring treatment were assigned. This cost estimate totals at 18 billion SEK for the group "industrial and other waste" corresponding to an average of 3,6 million SEK per site.

Radioactive waste

The radioactive wastes from nuclear plants have been the subject of a great deal of interest during the last 12-15 years.

The latest calculations indicate that the proposed disposal of nuclear wastes in connection with the planned phase-out of nuclear power in Sweden will cost 50 billion SEK. Since this includes contaminated parts of the plants themselves as well as other types of waste that do not increase in a linear fashion with operation time or power production, today's debt is estimated to 70%, that is 35 billion SEK.

BIOLOGICAL DIVERSITY

In a report for the Environmental Advisory Council, Jernelöv and Kågeson systematise preservation and restoration motives for biological diversity in Sweden, account for cost estimates and recommend actions. The largest

threats against species in Sweden come from alterations in land use and new techniques within forests and agricultural areas.

Certain parts of the efforts to conserve and restore biological diversity are relevant for the calculation of the environmental debt.

The costs for conserving threatened species in the form of Noah's ark (zoological and botanical gardens) can be seen as continuing defence. An estimated yearly cost for 130 million SEK corresponds to an environmental debt of 2,6 billion SEK.

Ditching of wetlands is probably the most serious interference with the Swedish environment regarding biochemical cycles. The restoration of 200 000 hectares of wetlands at a cost of 10 000/hectare corresponds to an environmental debt of 2 billion SEK.

The effects of recent year's politics concerning agriculture and forestry on the cost for biological diversity and the environmental debt are unclear. The environmental debt regarding biological diversity is therefore assumed to remain at the present level.

FINAL REFLECTIONS

There are three purposes to this report. First, to introduce the concept of environmental debt to stress the fact that pollution and interference with the environment lead to reduced future possibilities for a high production and material standard of living. In this respect, the environmental debt is similar to a financial debt that will require interest payments and subsequently be paid off in the future.

The second purpose is to illustrate how the environmental debt can be calculated. In many cases, the numerical data has been taken from other sources (a list of references can be obtained from the author). In more uncertain cases, estimates and calculations are based on the author's opinions. The reader can however, follow these procedures and make his/her own assumptions and calculations based thereupon. The uncertainty is in many cases considerable, and the accounted numbers can in several cases seem provocative. Even for my own part I must admit that I have been surprised over some relative or absolute part of the environmental debt. A possible debate as well as other person's calculations would undoubtedly lead to a more certain base and a better understanding for the future economical effects of today's different activities on the environment field.

The third purpose is to discuss the development of the environmental debt. Are we paying or borrowing? That question is unilaterally answered by the report: even in Sweden we are still borrowing from future generations, in spite of all that has been done already.

Respect for future generations is precisely carrying the moral argument for taking care of the environment. This appears in the report from the World Commission on Environment and Development; "without jeopardising the possibilities of future generations to satisfy their needs", and also in the words of wisdom that are said to originate from an old Sioux chief; "nature is not something we inherited from our ancestors, it is something we borrowed from our children".

If we look at nature as something we borrowed from our children, it becomes natural to think that we will leave what we borrowed in its original condition or together with resources for restoring the borrowed in its original condition. This can be said to be the fundamental philosophy behind the concept of environmental debt.

Within certain limited parts of our economy, we utilise a kind of environmental debt concept. In the costs for nuclear power, we include waste disposal and costs for demolition of nuclear plants. During certain mining enterprises, the exploiter is forced to visually restore the area, which means that the cost is included in the price of the merchandise. When industrial properties and enterprises are transferred in the USA today, the question of a possible environmental debt is of great consequence to the price. Several Swedish companies have encountered problems when they have neglected to rightly valuate this environmental debt.

The restoration cost has also been discussed, for example extended hydro-electric power. Valfrid Paulsson has said that for the same amount of money that it takes to build one kilometre of motor way, it should be possible to restore a built-out river to nearly its original state. The power industry has later taken this into consideration and suggested that one could "borrow" a river for exploitation during a certain time and then "restore" it.

Based on this cost estimate, the environmental debt in the form of restoration cost for Swedish hydro-electric power could be calculated and compared to the phase-out cost and environmental debt for other sources of energy.

Many persons with whom I have discussed the concept of environmental debt have spontaneously wanted to include neglected maintenance and thereby, future large repairs and new investments in communal cable networks. As this concerns restoration of a part of the technosphere it is therefore not included in the concept of environmental debt as it is defined in this report.

It is with some hesitation that I now part with this report. Several revisions and recalculations are behind this version and there is surely a lot more that

can and should be done to specify the environmental debt. However, I hope that the report will inspire more people to take a part in this work.

Statens offentliga utredningar 1992

Kronologisk förteckning

1. Frihet – ansvar – kompetens. Grundutbildningens villkor i högskolan. U.
2. Regler för risker. Ett seminarium om varför vi tillåter mer föroreningar inne än ute. M.
3. Psykiskt störddas situation i kommunerna –en probleminventering ur socialtjänstens perspektiv. S.
4. Psykiatrin i Norden –ett jämförande perspektiv. S.
5. Koncession för försäkringssammanslutningar. Fi.
6. Ny mervärdesskattelag.
   – Motiv. Del 1.
   – Författningstext och bilagor. Del 2. Fi.
7. Kompetensutveckling - en nationell strategi. A.
8. Fastighetstaxering m.m. – Bostadsrätter. Fi.
9. Ekonomi och rätt i kyrkan. C.
10. Ett nytt bolag för rundradiosändningar. Ku.
11. Fastighetsskatt. Fi.
12. Konstnärlig högskoleutbildning. U.
13. Bundna aktier. Ju.
14. Mindre kadmium i handelsgödsel. Jo.
15. Ledning och ledarskap i högskolan – några perspektiv och möjligheter. U.
16. Kroppen efter döden. S.
17. Den sista undersökningen – obduktionen i ett psykologiskt perspektiv. S.
18. Tvångsvård i socialtjänsten – ansvar och innehåll. S.
19. Långtidsutredningen 1992. Fi.
20. Statens hundskola. Ombildning från myndighet till aktiebolag. S.
21. Bostadsstöd till pensionärer. S.
22. EES-anpassning av kreditupplysningslagen. Ju.
23. Kontrollfrågor i tulldatoriseringen m.m. Fi.
24. Avreglerad bostadsmarknad. Fi.
25. Utvärdering av försöksverksamheten med 3-årig yrkesinriktad utbildning i gymnasieskolan. U.
26. Rätten till folkpension – kvalifikationsregler i internationella förhållanden. S.
27. Årsarbetstid. A.
28. Kartläggning av kasinospel – enligt internationella regler. Fi.
29. Smittskyddsinstitutet – ny organisation för Sveriges nationella smittskyddsfunktioner. S.
30. Kreditförsäkring – Några aktuella problem. Fi.
31. Lagstiftning om satellitsändningar av TV-program.Ku.
32. Nya Inlandsbanan. K.
33. Kasinospelsverksamhet i folkrörelsernas tjänst? C.
34. Fastighetsdatasystemets datorstruktur. M.
35. Kart- och mätningsutbildningar i nya skolformer. M.
36. Radio och TV i ett. Ku.
37. Psykiatrin och dess patienter – levnadsförhållanden, vårdens innehåll och utveckling. S.
38. Fristående skolor. Bidrag och elevavgifter. U.
39. Begreppet arbetsskada. S.
40. Risk- och skadehantering i statlig verksamhet. Fi.
41. Angående vattenskotrar. M.
42. Kretslopp – Basen för hållbar stadsutveckling. M.
43. Ecocycles – The Basis of Sustainable Urban Development. M.
44. Resurser för högskolans grundutbildning. U.
45. Miljöfarligt avfall – ansvar och riktlinjer. M.
46. Livskvalitet för psykiskt långtidssjuka – forskning kring service, stöd och vård. S.
47. Avreglerad bostadsmarknad, Del II. Fi.
48. Effektivare statistikstyrning – Den statliga statistikens finansiering och samordning. Fi.
49. EES-anpassning av marknadsföringslagstiftningen. C.
50. Avgifter och högkostnadsskydd inom äldre- och handikappomsorgen. S
51. Översyn av sjöpolisen. Ju.
52. Ett samhälle för alla. S.
53. Skatt på dieselolja. Fi.
54. Mer för mindre – nya styrformer för barn- och ungdomspolitiken. C.
55. Råd för forskning om transporter och kommunikation. K.
    Råd för forskning om transporter och kommunikation. Bilagor. K.
56. Färjor och farleder. K.
57. Beskattning av vissa naturaförmåner m.m. Fi.
58. Miljöskulden. En rapport om hur miljöskulden utvecklas om vi ingenting gör. M.
59. Läraruppdraget. U.
60. Enklare regler för statsanställda. Fi.
61. Ett reformerat åklagarväsende. Del. A och B. Ju.
62. Forskning och utveckling för totalförsvaret – förslag till åtgärder. Fö.
63. Regionala roller – en perspektivstudie. C.
64. Utsikt mot framtidens regioner – sju debattinlägg. C.
65. Kartboken. C.
66. Västsverige – region i utveckling. C.
67. Fortsatt reformering av företagsbeskattningen. Del 1. Fi.
68. Långsiktig miljöforskning. M.
69. Meningsfull vistelse på asylförläggning. Ku.
70. Telelag. K.
71. Bostadsförmedling i nya former. Fi.
72. Det kommunala medlemskapet. C.

Statens offentliga utredningar 1992

Kronologisk förteckning

73. Välfärd och valfrihet – service, stöd och vård för psykiskt störda. S.
74. Prova privat – Provning och mätteknik inom SP och SMP i europaperspektiv. N.
75. Ekonomisk politik under kriser och i krig. Fi.
76. Skogspolitiken inför 2000-talet. Huvudbetänkande. Skogspolitiken inför 2000-talet. Bilagor I. Skogspolitiken inför 2000-talet. Bilagor II. Jo.
77. Psykiskt störda i socialförsäkringen – ett kunskapsunderlag. S.
78. Utredningen om vissa internationella insolvensfrågor. Ju.
79. Statens fastigheter och lokaler – ny organisation. Fi.
80. Kriminologisk och kriminalpolitisk forskning. Ju.
81. Trafikpolisen mer än dubbelt bättre. Ju.
82. Genteknik – en utmaning. Ju.
83. Aktiebolagslagen och EG. Ju.
84. Ersättning för kränkning genom brott. Ju.
85. Förvaltning av försvarsfastigheter. Fö.
86. Ett nytt betygssystem. U.
87. Åtgärder för att förbereda Sveriges jordbruk och livsmedelsindustri för EG – förslag om vegetabiliesektorn, livsmedelsexporten och den ekologiska produktionen. Jo.
88. Veterinär verksamhet – behov, organisation och finansiering. Jo.
89. Bostadsbidrag – enklare – rättvisare – billigare. S.
90. Biobränslen för framtiden. Jo.
91. Biobränslen för framtiden. Bilagedel. Jo.
92. Pliktleverans. U.
93. Svensk skola i världen. U.
94. Skola för bildning. U.
95. Den svenska marknaden för projektkapital – statens nuvarande och framtida roll. N.
96. Förbud mot etnisk diskriminering i arbetslivet. Ku.
97. Sparar vi för lite? Hushållssparandet i samhällsekonomin. Fi.
98. Kommunernas socialbidrag – en kartläggning av normer, kostnader m.m. S.
99. Rådgivningen inom jordbruket och trädgårdsnäringen. Jo.
100. Staten och arbetsgivarorganisationerna. Fi.
101. Försvarsmaktens hälso- och sjukvård. Fö.
102. Myndigheternas förvaltningskostnader – budgetering av pris- och löneförändringar. Fi.
103. FHU92. A.
104. Vår uppgift efter Rio – svensk handlingsplan inför 2000-talet. M.
105. Administrativt stöd till Försvarsmakten. Fö.
106. Civilbefälhavarna. Fö.
107. Kulturstöd vid ombyggnad. Ku.
108. VAL, Organisation Teknik Ekonomi. Ju.
109. Investeringar i arrendejordbruket och andra arrenderättsliga frågor. Ju.
110. Information och den nya InformationsTeknologin – straff- och processrättsliga frågor m.m. Ju.
111. Den framtida skogsvårdsorganisationen. Jo.
112. Administrationen i kanslihuset. Klara administrationen – Bilaga. Fi.
113. Lag om företagsrekonstruktion. Ju.
114. Malmöregionens trafiksystem. Överenskommelse om åtgärder i trafikens infrastruktur. K.
115. Kontroll i konkurrens – avveckling av AB Svensk Bilprovnings monopol på kontrollbesiktning. K.
116. Privat förmedling och uthyrning av arbetskraft. A.
117. Konsumenterna och lågprisbutiken. En studie av ändrade köpvanor i dagligvaruhandeln. Jo.
118. Arvoden för vård hos privatpraktiserande läkare. S.
119. Svensk trädgårdsnäring – nuläge och utvecklingsmöjligheter. Jo.
120. Allmänna arvsfonden. S.
121. Vissa mervärdeskattefrågor. Fi.
122. Social bakgrund – studiestöd och övergång till högre studier. U.
123. Ett hav av möjligheter – AMU-Gruppen på väg mot 2000-talets utbildningsmarknad. A.
124. Bistånd under omprövning. Översyn av det svenska utvecklingssamarbetet med Moçambique. UD.
125. Åtgärder för att förbereda Sveriges jordbruk och livsmedelsindustri för EG – förslag om animaliesektorn. Jo.
126. Swedish Environmental Debt. M.

Statens offentliga utredningar 1992

Systematisk förteckning

Utrikesdepartementet

Bistånd under omprövning. Översyn av det svenska utvecklingssamarbetet med Moçambique. [124]

Justitiedepartementet

Bundna aktier. [13]
EES-anpassning av kreditupplysningslagen. [22]
Översyn av sjöpolisen. [51]
Ett reformerat åklagarväsende. Del A och B. [61]
Utredningen om vissa internationella insolvensfrågor. [78]
Kriminologisk och kriminalpolitisk forskning. [80]
Trafikpolisen mer än dubbelt bättre. [81]
Genteknik – en utmaning. [82]
Aktiebolagslagen och EG. [83]
Ersättning för kränkning genom brott. [84]
VAL, Organisation Teknik Ekonomi. [108]
Investeringar i arrendejordbruket och andra arrenderättsliga frågor. [109]
Information och den nya InformationsTeknologin – straff- och processrättsliga frågor m.m. [110]
Lag om företagsrekonstruktion. [113]

Försvarsdepartementet

Forskning och utveckling för totalförsvaret – förslag till åtgärder. [62]
Förvaltning av försvarsfastigheter. [85]
Försvarsmaktens hälso- och sjukvård. [101]
Administrativt stöd till Försvarsmakten. [105]
Civilbefälhavarna. [106]

Socialdepartementet

Psykiskt störda situation i kommunerna
–en probleminventering ur socialtjänstens perspektiv. [3]
Psykiatrin i Norden – ett jämförande perspektiv. [4]
Kroppen efter döden. [16]
Den sista undersökningen – obduktionen i ett psykologiskt perspektiv. [17]
Tvångsvård i socialtjänsten – ansvar och innehåll. [18]
Statens hundskola. Ombildning från myndighet till aktiebolag. [20]
Bostadsstöd till pensionärer. [21]
Rätten till folkpension – kvalifikationsregler i internationella förhållanden. [26]
Smittskyddsinstitutet – ny organisation för Sveriges nationella smittskyddsfunktioner. [29]
Psykiatrin och dess patienter – levnadsförhållanden, vårdens innehåll och utveckling. [37]
Begreppet arbetsskada. [39]
Livskvalitet för psykiskt långtidssjuka
– forskning kring service, stöd och vård. [46]
Avgifter och högkostnadsskydd inom äldre- och handikappomsorgen. [50]
Ett samhälle för alla. [52]
Välfärd och valfrihet – service, stöd och vård för psykiskt störda. [73]
Psykiskt störda i socialförsäkringen – ett kunskapsunderlag. [77]
Bostadsbidrag – enklare – rättvisare – billigare. [89]
Kommunernas socialbidrag – en kartläggning av normer, kostnader m.m. [98]
Arvoden för vård hos privatpraktiserande läkare. [118]
Allmänna arvsfonden. [120]

Kommunikationsdepartementet

Nya Inlandsbanan. [32]
Råd för forskning om transporter och kommunikation.
Råd för forskning om transporter och kommunikation. Bilagor. [55]
Färjor och farleder. [56]
Telelag. [70]
Malmöregionens trafiksystem. Överenskommelse om åtgärder i trafikens infrastruktur. [114]
Kontroll i konkurrens – avveckling av AB Svensk Bilprovnings monopol på kontrollbesiktning. [115]

Finansdepartementet

Koncession för försäkringssammanslutningar. [5]
Ny mervärdesskattelag.
– Motiv. Del 1.
– Författningstext och bilagor. Del 2. [6]
Fastighetstaxering m.m. – Bostadsrätter. [8]
Fastighetsskatt. [11]
Långtidsutredningen 1992. [19]
Kontrollfrågor i tulldatoriseringen m.m. [23]
Avreglerad bostadsmarknad. [24]
Kartläggning av kasinospel – enligt internationella regler. [28]
Kreditförsäkring – Några aktuella problem. [30]
Risk- och skadehantering i statlig verksamhet. [40]
Avreglerad bostadsmarknad, Del II. [47]
Effektivare statistikstyrning – Den statliga statistikens finansiering och samordning. [48]
Skatt på dieselolja. [53]
Beskattning av vissa naturaförmåner m.m. [57]
Enklare regler för statsanställda. [60]
Fortsatt reformering av företagsbeskattningen. Del 1. [67]
Bostadsförmedling i nya former. [71]

Statens offentliga utredningar 1992

Systematisk förteckning

Ekonomisk politik under kriser och i krig. [75]
Statens fastigheter och lokaler – ny organisation. [79]
Sparar vi för lite? Hushållssparandet i samhällsekonomin. [97]
Staten och arbetsgivarorganisationerna. [100]
Myndigheternas förvaltningskostnader – budgetering av pris- och löneförändringar. [102]
Administrationen i kanslihuset.
Klara administrationen – Bilaga. [112]
Vissa mervärdeskattefrågor. [121]

Utbildningsdepartementet

Frihet – ansvar – kompetens. Grundutbildningens villkor i högskolan. [1]
Konstnärlig högskoleutbildning. [12]
Ledning och ledarskap i högskolan – några perspektiv och möjligheter. [15]
Utvärdering av försöksverksamheten med 3-årig yrkesinriktad utbildning i gymnasieskolan. [25]
Fristående skolor. Bidrag och elevavgifter. [38]
Resurser för högskolans grundutbildning. [44]
Läraruppdraget. [59]
Ett nytt betygssystem. [86]
Pliktleverans. [92]
Svensk skola i världen. [93]
Skola för bildning. [94]
Social bakgrund – studiestöd och övergång till högre studier. [122]

Jordbruksdepartementet

Mindre kadmium i handelsgödsel. [14]
Skogspolitiken inför 2000-talet. Huvudbetänkande. [76]
Skogspolitiken inför 2000-talet. Bilagor I. [76]
Skogspolitiken inför 2000-talet. Bilagor II. [76]
Åtgärder för att förbereda Sveriges jordbruk och livsmedelsindustri för EG – förslag om vegetabiliesektorn, livsmedelsexporten och den ekologiska produktionen. [87]
Veterinär verksamhet – behov, organisation och finansiering. [88]
Biobränslen för framtiden. [90]
Biobränslen för framtiden. Bilagedel. [91]
Rådgivningen inom jordbruket och trädgårdsnäringen. [99]
Den framtida skogsvårdsorganisationen. [111]
Konsumenterna och lågprisbutiken. En studie av ändrade köpvanor i dagligvaruhandeln. [117]
Svensk trädgårdsnäring – nuläge och utvecklings möjligheter. [119]
Åtgärder för att förbereda Sveriges jordbruk och livsmedelsindustri för EG – förslag om animaliesektorn. [125]

Arbetsmarknadsdepartementet

Kompetensutveckling - en nationell strategi. [7]
Årsarbetstid. [27]
FHU92 [103]
Privat förmedling och uthyrning av arbetskraft. [116]
Ett hav av möjligheter – AMU-Gruppen på väg mot 2000-talets utbildningsmarknad. [123]

Kulturdepartementet

Ett nytt bolag för rundradiosändningar. [10]
Lagstiftning om satellitsändningar av TV-program. [31]
Radio och TV i ett. [36]
Meningsfull vistelse på asylförläggning. [69]
Förbud mot etnisk diskriminering i arbetslivet. [96]
Kulturstöd vid ombyggnad. [107]

Näringsdepartementet

Prova privat – Provning och mätteknik inom SP och SMP i europaperspektiv. [74]
Den svenska marknaden för projektkapital – statens nuvarande och framtida roll. [95]

Civildepartementet

Ekonomi och rätt i kyrkan. [9]
Kasinospelsverksamhet i folkrörelsernas tjänst? [33]
EES-anpassning av marknadsföringslagstiftningen.[49]
Mer för mindre – nya styrformer för barn- och ungdomspolitiken. [54]
Regionala roller – en perspektivstudie. [63]
Utsikt mot framtidens regioner – sju debattinlägg. [64]
Kartboken. [65]
Västsverige – region i utveckling. [66]
Det kommunala medlemskapet. [72]

Statens offentliga utredningar 1992

Systematisk förteckning

Miljö- och naturresursdepartementet

Regler för risker. Ett seminarium om varför vi tillåter mer föroreningar inne än ute. [2]
Fastighetsdatasystemets datorstruktur. [34]
Kart- och mätningsutbildningar i nya skolformer. [35]
Angående vattenskotrar. [41]
Kretslopp – Basen för hållbar stadsutveckling. [42]
Ecocycles – The Basis of Sustainable Urban Development. [43]
Miljöfarligt avfall – ansvar och riktlinjer. [45]
Miljöskulden. En rapport om hur miljöskulden utvecklas om vi ingenting gör. [58]
Långsiktig miljöforskning. [68]
Vår uppgift efter Rio – svensk handlingsplan inför 2000-talet. [104]
Swedish Environmental Debt. [126]

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