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THE PARABLE OF THE CARPENTER

Introduction for the workshop Valuation Methods for Green National Accounting: a Practical Guide, organized by The World Bank, U.N. Statistical Office and Ecological Economics, Washington, D.C., March 20-22, 1996

Increase in production, as measured in national income, is generally called economic growth and identified with economic success. Growth, defined in this manner, is given the highest priority in economic policy in every country in the world. However, economic growth, defined correctly, can mean nothing other than increase in welfare. Economic action is successful when it increases the level of our satisfaction of wants, our welfare. Production is, of course, an important indicator for welfare, since all economic action, including production, is aimed at the satisfaction of wants, in other words: welfare. Yet welfare is dependent on quite a few other factors. One of them is certainly the current and future quality of the environment.

For an economic approach, the environment can best be defined as our physical surroundings on which we are dependent in all our activities: water, air, soil, space, natural resources and plant and animal species. Our surroundings can, in turn, be conceived as a collection of possible uses, called 'environmental functions' or, in short, 'functions'. When the use of a function is at the expense of another, or the same function, or threatens to be so in the future, the environment has acquired an economic aspect. We call this competition between functions. There are three kinds of competition between functions: spatial, qualitative and quantitative.

Competing functions are normal economic goods, because they fully meet the definition of scarcity: a good is scarce when something else we would like to have (an alternative) has to be sacrificed to acquire it. Losses of functions form costs, irrespective of whether or not they are expressed in monetary terms. Losses of functions can always be measured in physical terms. That is why environmental statistics form the basis for the valuation of losses of environmental functions. Valuation comes down to translating losses of function, recorded in physical terms, into monetary terms.

A well-known example of qualitative competition is that after exceeding certain thresholds the function 'dumping ground for waste' of water, air and soil is at the expense of functions such as 'water as raw material for the drinking water supply' and 'air for the physiological functioning of humans, plants and animals'. Quantitative competition has, of course, to do with resources, such as the severe competition between the different uses of the limited stock of water, and the threatening depletion of the stock of fossil fuel and metal resources. The use of space for all kinds of productive and consumptive functions is at the expense of the function 'space allowing the existence of natural ecosystems', which is probably the main cause of the extinction of species. Personally I consider the loss of space in the big cities for children to play and to discover their surroundings independently as the greatest cultural loss since the death of Mozart. Another example of how the use of a function can compete with itself, besides the functions of non-renewable energy and metal stocks, is that the function 'water as accommodation for species of fish' is in competition with itself as soon as overfishing a certain species is threatening its survival.

If we take a close look at the numerous kinds of competition, as has been done in Hueting (1974), we arrive at the conclusion that the heart of the conflict of competing functions is that the environment is being used for raising production and consumption in the short run at the expense of other desired uses and of the future availability of functions. In other words: the conflict comes down to the question of using environmental functions sustainably or unsustainably. Environmental functions are clearly the most fundamental scarce, and consequently economic goods at the disposal of human beings, because they are our life-support systems. Therefore I fail to understand how the process that is accompanied by the destruction of these economic goods can be called economic growth and economic success, and therefore I consider adaptation of the national income figures for losses of function an urgent task.

I am happy that after so many years this task has gained political interest, as a result of which there is a better chance that official statistical offices will start to fulfil this task. But I am worried about the existence of more than ten different methods in the literature of ecological economics for the valuation of environmental losses, with outcomes that differ by a factor of ten or a hundred or more. As far as I know, there is nothing similar in the beta sciences. I predict that, as long as this situation continues to exist, politicians and the public will react by saying: "What are we supposed to do with these outcomes, for heaven's sake?". I will therefore try to provide a solution to this problem with the aid of the parable of the carpenter.

Suppose we want to know the surface of this room and invite a carpenter to do the job during lunch time. After the lunch the carpenter tells us: "If I use method A the surface is 80 square meters, but if I use method B it is 310, and if I use method C, I arrive at 4540 square meters". We will probably dismiss this carpenter and invite another one. So the second carpenter starts working and tells us after a while: "You were so impatient about the result, that I forgot my ruler in the hurry to please you. Therefore I took two branches from a nearby tree, risking a fine. If I assume that the longer branch is one meter, the surface of the room is 150 square meters, if I assume that the shorter branch is one meter I arrive at 210". Most of us will probably find this result useful, although it is not exactly the outcome we were hoping for.

The parallel with the valuation methods is as follows.

For the valuation of environmental functions, the construction of a supply curve is indispensable. The supply curve reflects the sacrifices that have to be made to regain the lost availability of a function. If no sacrifice has to be made, the marginal utility, or value, or price of that function equals zero. Consequently, the function is a free good, falling outside economics, and there are no costs involved in the use of it. Starting from the observation that the burden on the environment is determined by the number of people, the amount of activity per person, and the nature of the activities, the supply curve, otherwise known as the elimination cost curve, is composed of the costs of five categories of measures. These are arranged by increasing annual costs per unit of function regained (expressed in a physical parameter).

The measures are: (1) All kinds of technical measures that eliminate the burden at the source, so that the regenerative capacity of nature can restore the function. (2) For non-renewables, regeneration takes the form of developing and bringing into practice substitutes. For example, solar energy to replace fossil fuels, and glass fibre instead of copper wire. Also belonging to this category are increasing efficiency and recycling. These are temporary solutions. (3) Direct shifts from environmentally burdening to less burdening activities, when technical measures are not enough to reach a certain point on the supply curve, for instance the sustainability point. (4) Reduction of activities, so more leisure time. (5) Reduction of the population, resulting in a drop in the volume of activities.

When looking at these measures we should bear in mind that adapting national income for environmental losses comes down to a comparative static model exercise, in which time plays no role, as explained in the papers submitted to this workshop (Hueting et al., 1992, 1995). It should be clear that supply curves can always be constructed.

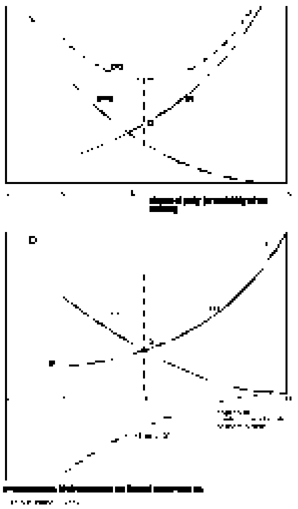
The construction of a demand curve is indispensable as well. It is a prerequisite for establishing the point on the supply curve on which to base the valuation. A demand curve reflects the preferences for a given good. If there are no preferences for a function, that function is again not an economic but a free good, with a marginal utility and consequently a value or price that equals zero. The demand curve is composed of all kinds of expenditure or intended expenditure that reveal the preferences for the original functions with which nature supplies us.

I will give the following examples. Expenditure on compensation, such as on provisions for the drinking water supply, made necessary because of a partial loss of the function 'drinking water'. Financial damage, for example by flooding resulting from loss of the function 'regulator of the water flow' of forests. Travel costs to nature reserves. Money people claim to be willing to pay for the availability of functions. Ricardonian rent paid via the market for obtaining the many functions of natural resources. There is overwhelming evidence that complete demand curves can be construed only by way of exception. Complete demand curves cannot be constructed at all for functions on which future production and consumption depend (Hueting, 1989, 1992).

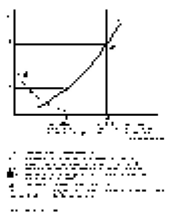
According to a generally accepted assumption (with only few exceptions), the market mechanism brings about a package of goods that reflects the preferences of the economic subjects, provided the institutional framework within which the market operates is acceptable to the economic subjects. About 80 percent of the production recorded in the national accounts is produced for the market; the added value of the remainder is derived from market data. Therefore adapting national income figures requires the construction of shadow prices that are directly comparable with market prices. The construction of demand and supply curves provides such a procedure in principle. *If* a complete demand curve could be constructed, *then* the minimum of the two curves added together would provide the minimal total social costs for obtaining the desired availability of functions. This point corresponds with the intersection of the first derivatives of these curves, which then would indicate the shadow price. See Figure 1. However, complete demand curves cannot be construed.

This has two consequences. First, it means that the true value of goods produced and consumed at the expense of the environment is equally unknowable, because these values have to be reduced by the unknowable value of the losses of function caused. This value, moreover, differs per commodity. Second, it means, that for the valuation of environmental functions, we cannot escape from making assumptions about the intensity of the preferences for their availability.

Figuur1. Costs of elimination and revealed preferences for an environmental function; (A) total curves, (B) marginal curves



If we think of the parable of the carpenter, this conclusion should by no means lead to pessimism about green accounting. True, the conclusion means that there are as many green national income figures as there are assumptions about the demand curve. However, information based on assumptions that are well-defined give very useful information indeed. For example, it does not seem difficult to first define sustainability as a situation in which the environmental functions on which future production is dependent remain available for ever, given the technology in the historical study year (Hueting and Reijnders, 1996). Next to make it explicit clearly that we assume preferences for sustainability, which comes down to a production and consumption level that can be sustained for ever with the technology available in the historical study year. And finally to present the outcome that this level, the Sustainable National Income, equals roughly x percent of standard National Income (Hueting et al., 1992, 1995). See Figure 2.



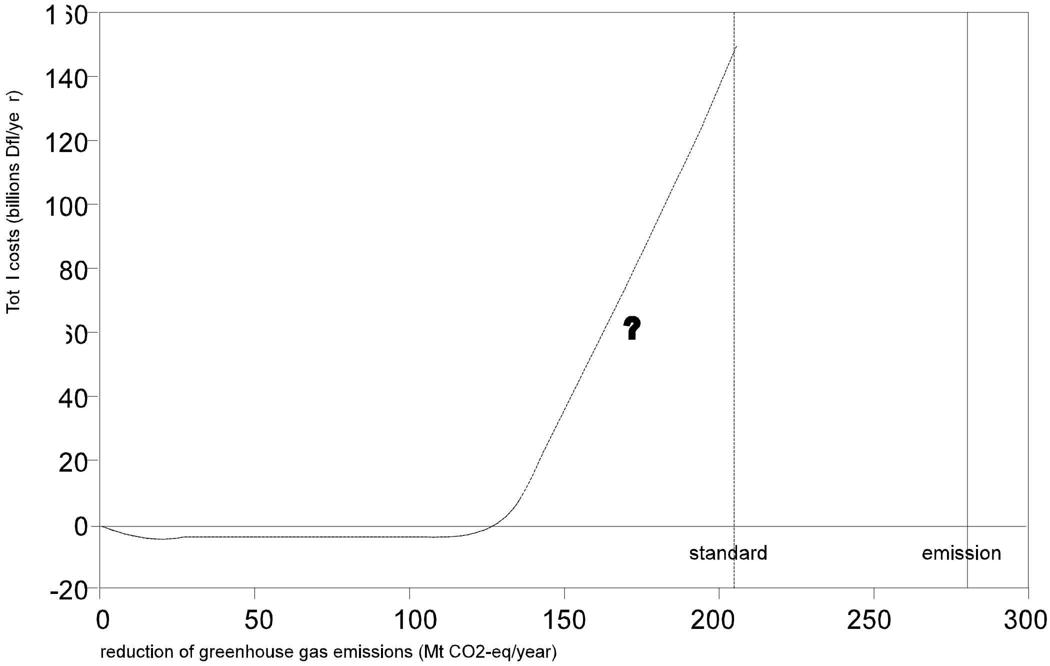
Politicians and the public will understand this piece of information very well, and be happy, because then they have some idea about what has to be done in technology, substitutes, population policy and lifestyle to arrive at the environmentally sustainable development they advocate. If they ask for outcomes based on other assumptions, which they probably will do, the answer can be given quickly on the basis of the calculated supply or elimination costs curves.

I am much more worried about what Daly and Cobb (1989) call 'misplaced concreteness'. I will give one example. Any valuation that makes use of a positive discount rate, implicitly makes an assumption about preferences for the current and future availability of environmental functions that comes down on assuming that the preferences for their sustainable use are practically zero (Hueting, 1991). As follows from the above, there is no objection at all to making such assumptions, as long as the implicit assumptions are made explicit. Unfortunately, this is not the case in the studies I have seen.

Of course, there is much more to be said about green accounting and about the estimate of sustainable national income, as one of the possibilities. I hope this can be done the next 20 minutes and the next two days in the workshops. I now would like to finish by giving a few practical examples of the construction of elimination costs curves, one of which contains the first quantitative results of the sustainable national income research. See Figures 3, 4, 5, 6 and 7.

Figure 3

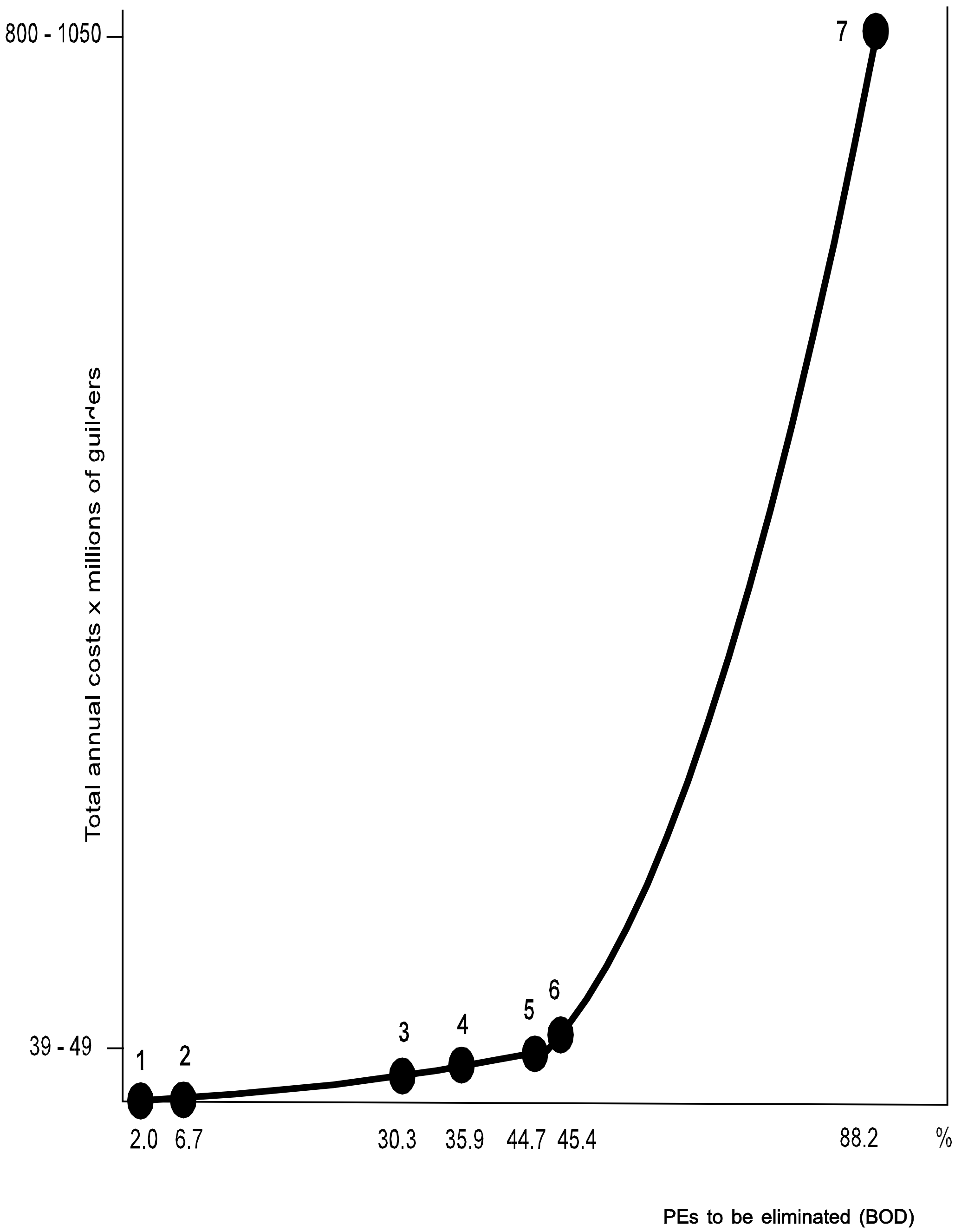
Total costs of reduction of greenhouse gas emissions in the Netherlands, 1990



From De E oer (1996)

Figure 4

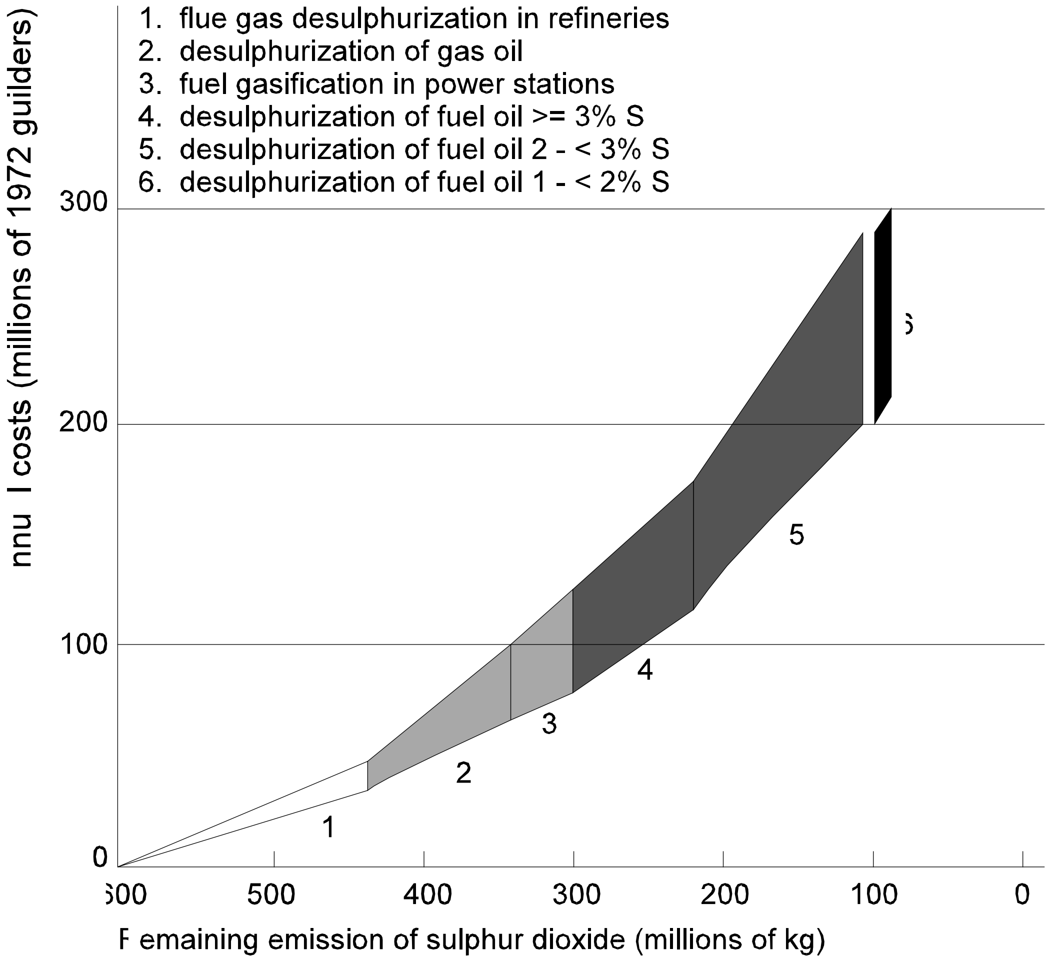
Elimination cost curve for biodegradable organic matter



From Hueting (1974)

Figure 5

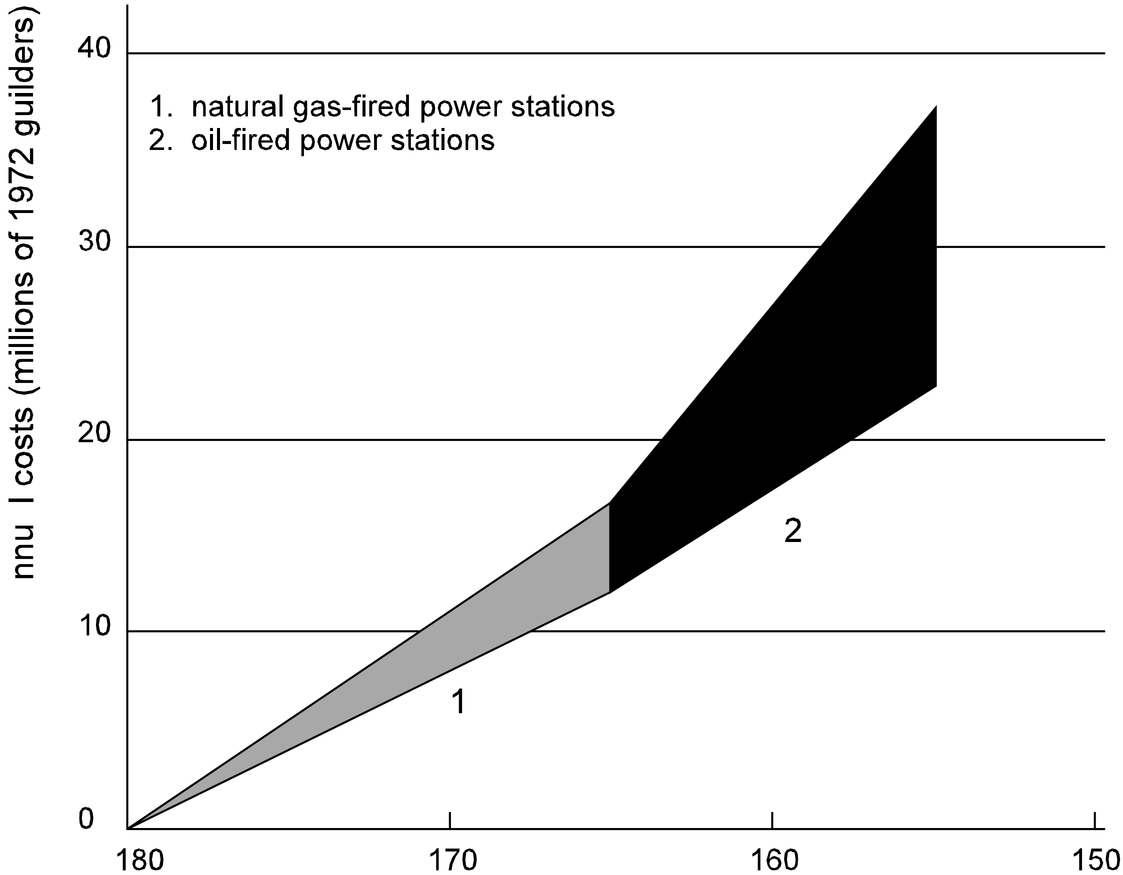
Sulphur dioxide: Annual costs of emission restriction as a function of the remaining emission



From Hueting (1974)

Figure 5

Nitrogen oxides: Annual costs of emission restriction as a function of the remaining emission

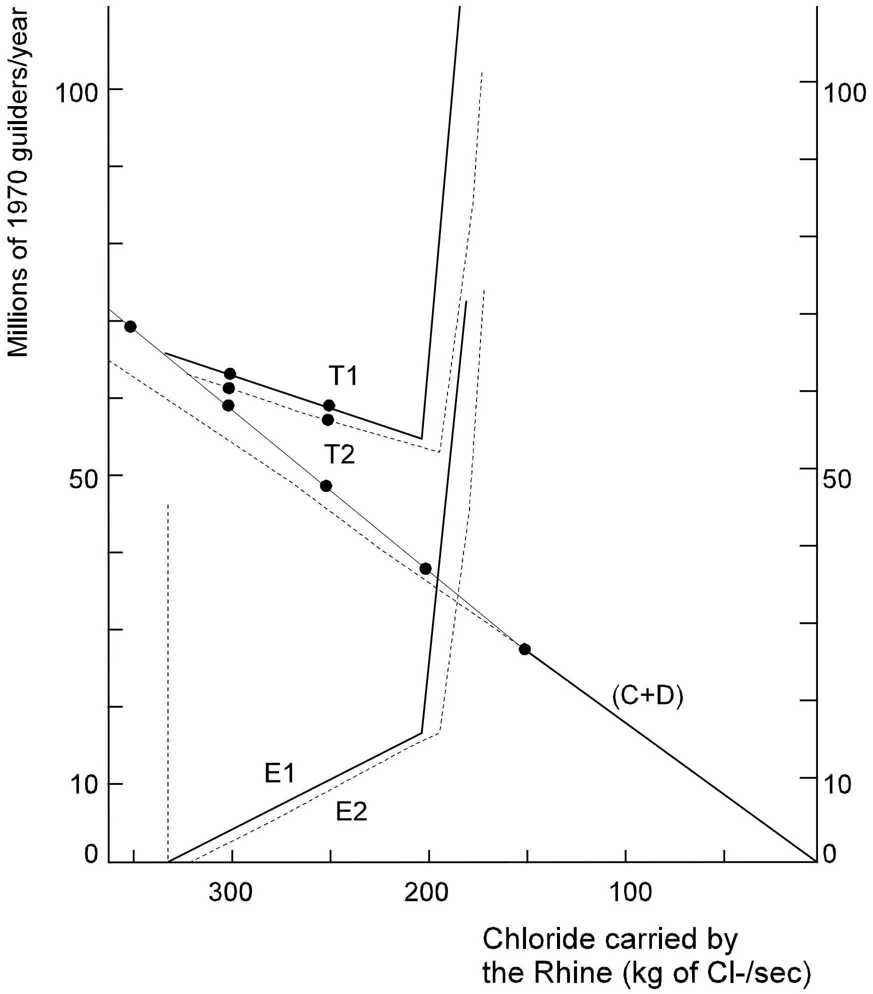


remaining emission of nitrogen oxdides (millions of kg of NO_2)

From Hueting (1974)

Figure 7

Weighing of costs and benefits of the prevention of chloride discharges into the Rhine



E = elimination costs
(C+D) = compensation plus damage costs
T = Total costs

From Hueting (1974)

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