SERV
SOCIAAL-ECONOMISCHE RAAD
VAN VLAANDEREN

Jozef II-straat 12-16
1000 Brussel
Tel. : 02/217 07 45
Fax : 02/217 70 08

An assessment of the distributive effects of the wastewater charge and drinking-water tariffs reform on households in the Flanders Region in Belgium

Brussels, SERV, may 1998

Peter Van Humbeeck
SERV
Jozef II-straat 12-16
1000 Brussel (Belgium)
phone +2/217.07.45
fax +2/217.70.08
e-mail pvhumbeeck@serv.be

PVH/mil/soccorr/wastewater_def.doc

1. INTRODUCTION

1.1 Purpose of this paper

In the Flanders Region in Belgium, households each year pay a wastewater charge and a fee for the consumption of drinking-water. Both are levied separately, although the wastewater charge is also calculated from the amount (m^3) of drinking-water consumed. The wastewater charge is a tax that has to be paid to the Flemish government. It is used to finance environmental expenditures[1]. The drinking-water fee is a price that has to be paid to one of the 24 private water companies in Flanders. Its revenue is used to pay for the costs of drinking-water production and distribution.

The wastewater charge has always been accompanied by a social measure, aimed at offsetting some of the welfare costs of the charge for lower income groups and larger families. There were no comparable measures for the drinking-water fees.

By decree (law) of December 20, 1996[2], however, the previous social correction of the wastewater charge (the so-called Ks factor) was abolished. Instead, a tax exemption for certain underprivileged population groups was introduced. Moreover, the decree introduced a new system for the calculation of the drinking-water fee. Domestic water supply subscribers now receive 15 m3 of drinking-water per person per year for free. The new system was introduced because the Ks factor did not satisfy. This was demonstrated in MIRA 1[3] and earlier by the SERV[4]. Still, whether the newly proposed measures would yield better results, remained unclear[5].

The free supply of 15 m3 of drinking-water per person was presented to the Flemish Parliament and the Flemish population as a measure to compensate for the abolishment of the Ks factors in the wastewater charge[6]. Indeed, the Flemish government assumed that, considering the statistic relation between water consumption and family income on the one hand, and water consumption and family size on the other, the water expenses would decrease due to the new regulation, for households with a low family income and for families with a low per capita consumption, which, due to advantages of scale, are mostly larger families[7]. The explanatory memorandum, accompanying the program decree 1997, stated

---

[1] For a discussion of environmental charges in Flanders, see VAN HUMBEECK, P. Environmental Taxation in Flanders. In *Environmental Taxation and Accounting*, 1997, Vol 1, No 4, p. 52-61.

[2] BOG 31.12.1996, 3rd ed., p. 32560-32562.

[3] Decoster, A. and H. Van Dongen. *Distributive effects of anti-pollution taxes*. Environment and nature report Flanders 1994. Scientific report. Mechelen, Flemish Society for the Environment, 1994.

[4] SERV, 1993

[5] Vl.P., 1996-1997, 428/18; Vl.P., 1996-1997, 565/1.

[6] Vl.P., 1996-1997, 428/18; Vl.P., 1996-1997, 565/1; Flemish Society for the Environment. *Wastewater taxes*. Info folder. Erembodegem, Flemish Society for the Environment (VMM), 1997.

[7] Vl.P., 1996-1997, 428/18; p. 4 and 19.

that *the effect of the free supply automatically entails the desired social correction"*[8]. As a consequence, the reform of the wastewater charge and the drinking-water tariffs was assumed to score better on a social level than the previous social correction. There has however never been a thorough ex ante study comparing the social welfare effects of the former and proposed regulation.

In this paper we analyse the social welfare effects of this reform. The two sides of the reform are analysed. First, we examine to what extent the new system for the wastewater charge (tax exemption instead of the abolished Ks factor) offers a better social protection than the previous system (the Ks factor). Second, the social distributive effects of the entire new system are analysed, i.e. including the free supply of 15 m3 of drinking-water per person.

1.2 Scope

The present paper is restricted to an analysis of the social effects of the reform. A more overall assessment could include other aspects as well.

A social compensation scheme within environmental policy cannot be evaluated on its social effectiveness alone, but should also be measured against the principles and objectives of environmental policy (e.g. the polluter pays principle) and be checked for its feasibility.

An overall assessment of the new tariff structure for drinking-water should not be limited to an analysis of the social effects on households either:

- The reform is not only meant as a compensation for the abolition of the Ks factors in the wastewater charge, but also as an incentive for more *rational water consumption;*
- The reform does not only have consequences for households. *Companies* are confronted with the effects of the new system as well. Indeed, the water companies compensate the costs of supplying 15 m3 of drinking-water per person free by marginal price increases (price per m3 drinking-water). Companies do not receive a free supply of a certain quantity of water, but are in many cases confronted with increased tariffs. This results in higher drinking-water expenses for a considerable number of companies;
- The aspect of *feasibility* is important. The minister announced that he will discuss the possible practical problems related to the implementation of the reform with the water companies[9];

These aspects are certainly worth a thorough analysis, but are beyond the scope of this paper.

[8] Vl.P., 1996-1997, 428/1, p. 16.
[9] Vl.P., 1996-1997, 428/18, p. 9.

1.3 Organisation of the paper

Beside this introduction, this paper contains four chapters. In part 2 the subject of the analysis is described. Part 3 describes the method used. Part 4 contains the results of the analysis. In part 5 the conclusions are drawn.

2. SUBJECT OF THE ANALYSIS

2.1 Social compensation policies and the wastewater charge

Until 1989, Flemish households paid user charges to the wastewater treatment companies. After the transitory scheme of 1990, a new tax system was introduced in 1991. Its basic elements still apply. Households no longer pay user charges to the wastewater treatment companies, but have to pay a wastewater tax to the Flemish government. Its revenue, together with the receipts from other environmental taxes (waste, manure, groundwater, administrative taxes, …), is allocated to an environmental fund that finances a variety of environmental expenditures (air, waste, wastewater, soil sanitation, …)[10].

In calculating the wastewater charge, a difference is made between large and small consumers. Small consumers are taxpayers with a water consumption below 500 m3 per year and/or with a pump capacity of less than 5 m3 per hour. This group consists mainly of households and some smaller companies. In principle, the charge for these small consumers is calculated by multiplying their water consumption by the conversion coefficient that is applied for domestic wastewater effluents. A conversion coefficient expresses the quantitative relation between a certain parameter that can easily be measured[11] and the pollution resulting from this activity. The tax formula, applied for small consumers looks as follows:

$$H = T \times OC \times Q \qquad (1)$$

with

- H = the tax amount that is due;
- T = the flat tax rate (600 BEF[12] in 1991-1995, 900 BEF in 1996-1998[13]);
- OC = the conversion coefficient that is applied for domestic wastewater effluents (0.025)
- Q = Qw + Qg and

[10] For an overview and discussion, see VAN HUMBEECK, P. Environmental Taxation in Flanders. In *Environmental Taxation and Accounting*, 1997, Vol 1, No 4, p. 52-61.

[11] For small consumers, the water consumption is used; for industrial activities, this parameter is often annual production.

[12] 1 Belgian Franc (BEF) = 0.0246 ECU = 0.027 USD; 1 ECU = 40.650 BEF ; 1 USD = 36.75 BEF

[13] The rates for the wastewater charges have been linked to the index of consumption prices from 1994 onwards. The real rate in 1998 e.g. is 991 BEF.

Q_W = the water consumption as mentioned on the invoice of the water company expressed in m^3;

Qg = 30 x the number of family members for households using water from a private water collection system (groundwater, rain, …);
10 x the number of family members for households consuming both water from the water companies and from a private water collection system;
500 m^3 for companies with a private water collection system.

As early as 1991, the social effects of the wastewater charge were mitigated for small consumers. The first 30 m3 of water consumed per household was exempt from charges. Furthermore, there was a reduction of 250 BEF per child, starting from the third child. In other words, the 1991 charge was calculated by applying the following formula:

$$H = T \times OC \times (Q - 30) - 250 \times (k - 2) \qquad (2)$$

With
H, T, OC and Q as in (1)
k = the number of children
and the second term is applied only for families with 3 or more children.

Due to administrative difficulties with the implementation of these measures, a new social compensation scheme was introduced in 1992. From then on, the charge was multiplied by a social compensation factor Ks. For households, it varied between the 0.20 and 0.95, depending on volume of water consumption. Hence, until 1996 the tax amount was calculated as follows:

$$H = T \times OC \times Q \times Ks \qquad (3)$$

With
H, T, OC and Q as in (1)
Ks for companies = 1;
for households depending on the volume of water consumption:

Q_W	0-50	51-100	101-150	151-200	201-300	301-400	401-500
K_S	0,20	0,40	0,60	0,70	0,85	0,9	0,95

It soon appeared that this scheme did not perform well. A survey by the SERV showed that the costs of the wastewater charge were levelled off somewhat (on average), compared to a charge without Ks factor, but the progressive rate could still not eliminate the fact that the lowest income groups pay substantially more taxes as a share of their total income than the higher income groups. Moreover, the scheme weighted heavily on the larger households[14].

[14] SERV, 1993.

Later, a MIRA-study yielded similar results[15]. At that time, several alternatives have been proposed[16], but the scheme was maintained.

Finally, the Ks factors were abolished as of 1997. Instead, a tax exemption was introduced for certain underprivileged population groups: taxpayers who enjoy the minimum state pension, the subsistence money allocated by the Belgian social welfare organisation, or the allowance that replaces the income for the disabled. The current formula used for the calculation of the wastewater charge for small consumers who are not exempt, corresponds with the above-mentioned formula (1). The same decree however also introduced a new regulation for drinking-water. More in particular, from 1997 on, the water companies must supply their domestic customers with 15 m3 of drinking-water per person per year free of charge. This free supply of 15 m3 of drinking-water per person was expressly presented to the Flemish Parliament and to the Flemish population as a measure to compensate for the abolition of the Ks factors in the wastewater charge.

Table 2.1. summarises the most important evolutions. For each year, a rough estimate is given of the number of households benefiting from the social compensation scheme, of the (theoretical) tax revenue (small consumers only) without social correction, of the real tax revenue (small consumers only), and of the losses in revenue resulting from the social compensation scheme.

Table 2.1. The wastewater charge for families/small consumers and its social correction

Year	*(BEF)*	*OC*	*Q (mio m3)*	*Social correction*	*Number of benefiting families (1000) max. 2.100*	*Theoretical tax revenue without social correction (mio BEF)*	*Real tax revenue (mio BEF)*	*Losses due tot social correction (mio BEF)*
1990	300/pers	-	-	Max. 1.200/family	190	1,700	1,620	80
1991	600	0,025	210	Exemption 30 m3 - 250/child from 3rd	2,100 160	3,240	2,250	940 50
1992	600	0,025	210	Ks factor	2,100	3,240	2,310	930
1993	600	0,025	210	Ks factor	2,100	3,240	2,310	930
1994	615	0,025	210	Ks factor	2,100	3,320	2,370	950
1995	628	0,025	210	Ks factor	2,100	3,390	2,420	970
1996	956	0,025	210	Ks factor	2,100	5,160	3,680	1,480
1997	980	0,025	210	exemption soc. Cat. by drinking-water invoice	150 2,100	5,290	5,030	260 0

[15] Decoster, A. and H. Van Dongen. *Distributive effects of anti-pollution taxes*. Environment and nature report Flanders 1994. Scientific report. Mechelen, Flemish Society for the Environment, 1994.

[16] See SERV, 1993; BGJG (Bond van Grote en Jonge Gezinnen). *Viewpoint on the anti-pollution tax on surface waters*: evaluation of the new system and proposal of a family friendly tax. Brussels, BGJG, July 1992; Vl.R., 1993-1994, 415/6; Vl.R., 1993-1994, 487/1.

2.2 Comparison of the former and current situation

This paper evaluates the distributive effects of the current situation compared to the previous one. The current situation is characterised by (1) the abolishment of the Ks factor in the wastewater charge, (2) the introduction of a wastewater charge exemption for underprivileged population groups, and (3) the free supply of 15 m3 of drinking-water per person.

In the analysis, and particularly in the policy conclusions, a difference will be made between the current situation with respect to the wastewater charge only, and the current situation as a result of the overall reform, i.e. including the reform of the drinking-water supply.

In the quantitative analysis, the current situation will however be restricted to the abolition of the Ks factor and the free supply of 15 m3 of drinking-water per person per year. In other words, the analysis does not take into account the tax exempt. There are two reasons. The first is practical. The available data (see chapter 3) is insufficiently detailed to allow a numeric analysis of the exemption. The second reason is that the exemption is a specific measure, i.e. a measure applicable to well-defined population groups. It can be combined with any general measure. This is why below both general measures are first analysed. In a separate paragraph, we investigate the influence of the specific measure (the tax exemption) on the conclusions.

2.3 Comparison and assessment of the distributive effects

An analysis on the social impact or the distributive effects of a measure usually distinguishes between two dimensions. The first dimension relates to *vertical equity* and is determined by the income level. Vertical redistribution implies a change in the incomes structure: purchasing power is transferred from the higher incomes to the lower incomes (from rich to poor) or vice-versa. The second dimension relates to *horizontal equity.* The latter concerns incomes transfers between social categories in relation to differences in living conditions. Horizontal redistribution transfers purchasing power from low to high risk groups (from the healthy to the sick, from employed to unemployed, from childless people to people with children etc.). Below, the impact of the wastewater charge and the drinking-water tariffs on both criteria will be analysed.

Beside these two criteria, relating to equity, the criterion of allocative efficiency is of primary importance when choosing or evaluating social compensation schemes *in environmental policy.* This can be illustrated by the "the polluter pays" principle[17]. This principle does not

[17] See OECD. *The polluter-pays principle*. Environment Monograph. Paris, OECD, 1992, p. 14 and 25. This Environment Monograph contains OECD papers, council acts and declarations relevant to the Polluter Pays Principle and to an understanding of its scope.

only aim to promote the rational use of the environment and nature by including environment damages in the prices of goods and services (efficient allocation of production factors). It is also a normative choice based on considerations of equity: it is fair to charge the party that is responsible for the environment damages and costs it has caused.

Finally, when designing a social compensation scheme, some other points have to be taken into account, such as: feasibility, a sufficient degree of focus and selectivity, sufficient and timely compensation, sufficient administrative simplicity for the beneficiary and sufficient publicity of the scheme[18].

In this paper, neither the criterion of efficiency nor the other points mentioned are examined. The attention is focused on the comparison of the horizontal and vertical distributive impact on households. There is, indeed, a great demand for insight in the effectiveness on the social level[19]. Moreover, the practical aspects of the water supply reform are being evaluated by the Minister for the Environment and the drinking-water companies[20].

3. METHODOLOGY

3.1 Methodology and required data

The purpose of our analysis is to make a comparison between the distributive impact of the current and former situation as defined above.

Upon the introduction of the new scheme, the Flemish minister for the environment also made a comparison with the previous system[21]. He compared the situation of a family consisting of a X members and with a low, average or high water consumption in the new drinking-water tariff structure with the former situation and with other family types. He showed parliament that families with a low drinking-water consumption per person would have to pay less on average, while families with a high consumption per person would have to pay more (see table 3.1).

[18] SERV, 1993.
[19] See Vl.P., 1996-1997, 428/18
[20] Vl.P., 1996-1997, 428/18, p. 9.
[21] Vl.P., 1996-1997, 428/18, p. 3-4.

Table 3.1. Comparison between the former and current situation

Number of family members	*Amount due in francs (subscription fee excluded) for an annual water consumption of:*							
	20 m³/person		30 m³/person		40 m³/person		60 m³/person	
	40fr/m³(1)	*59fr/m³(2)*	*40fr/m³(1)*	*59fr/m³(2)*	*40fr/m³(1)*	*59fr/m³(2)*	*40fr/m³(1)*	*59fr/m³(2)*
1	800	295	1,200	885	1,600	1,475	2,400	2,655
2	1,600	590	2,400	1,770	3,200	2,950	4,800	5,310
3	2,400	885	3,600	2,655	4,800	4,425	7,200	7,965
4	3,200	1,180	4,800	3,540	6,400	5,900	9,600	10,620
5	4,000	1,475	6,000	4,425	8,000	7,375	12,000	13,275

(1) Regulation without free water supply.

(2) Regulation with 15 m³ of free water supply per year and per person.

Source: Vl.P., 1996-1997, 428/18, p. 19.

Using information on the real drinking-water tariffs, this table can be updated and applied to the real situation. Table 3.2. shows the differences between the situation before and after the new regulation came into effect for one particular region (Flemish Water Company, VMW, section East of Flanders).

Table 3.2. Effects of the current regulation on the drinking-water for VMW (section East of Flanders).

Number of family members	*Amount due in francs for an annual water consumption of:*							
	20 m³/person		30 m³/person		40 m³/person		60 m³/person	
	(1)	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*	*(1)*	*(2)*
1	1,526	1,829	1,787	2,433	2,222	3,037	3,091	4,245
2	2,222	2,131	3,091	3,339	3,960	4,547	5,699	6,964
3	3,091	2,433	4,395	4,245	5,699	6,058	8,306	9,683
4	3,960	2,735	5,699	5,152	7,437	7,568	10,914	12,402
5	4,829	3,037	7,002	6,058	9,175	9,079	13,521	15,121

(1) Regulation without free water supply.

(2) Regulation with 15 m³ of free water supply per year and per person.

Source: own calculations based on VMW data.

Similar tables can be drawn for all 24 water companies in Flanders. The results will differ for each company because of variations in tariffs and tariff structures. Table 3.3 illustrates that, generally, it appears that larger families with a low water consumption per person will have to pay less, while other family types will have to pay more, but the situation clearly differs from company to company and sometimes from municipality to municipality within the same company.

Table 3.3. Comparison of the former and current situations for a few water companies

Number of family members	*Comparison drinking-water expenses previous and current situation for an average consumption (in m3) per person of*											
	20	30	40	60	20	30	40	60	20	30	40	60
	VMW East Flanders				*VMW Limburg*				*PIDPA*			
1	+	+	+	+	+	+	+	+	+	+	+	+
2	-	+	+	+	-	+	+	+	+	+	+	+
3	-	-	+	+	-	+	+	+	-	+	+	+
4	-	-	+	+	-	-	+	+	-	+	+	+
5	-	-	-	+	-	-	+	+	-	-	+	+
	BIW Steenokkerzeel				*TMVW Kruishoutem*				*IWVB*			
1	+	+	+	+	-	-	-	+	-	-	+	+
2	+	+	+	+	-	-	-	+	-	-	+	+
3	+	+	+	+	-	-	-	+	-	-	+	+
4	-	+	+	+	-	-	-	+	-	-	+	+
5	-	-	+	+	-	-	-	+	-	-	+	+

- means that this particular family category now pays less than before
+ means that this particular family category now pays more than before
Source: own modelling based on the data of the water companies

Scientific literature, however, stresses the danger of working with "family types"[22]. For example, how many families of 5 persons that have an average consumption of 20m3 per person really exist in Flanders? Probably very few. This information can therefore be misleading. Moreover, such kind of analysis may only yield partial information. It may not include possible adaptations in the families' behaviour (more rational water consumption), for instance. There is neither a link with impacts on income distribution. Concerning the latter, the Flemish Government intuitively stated: "*Logically it has (…) to be assumed that the price for the additional tap water will rise substantially as a consequence of the obligation to supply minimum quantities of tap water free of charge. The free supply of the first 15 m³ per person, combined with an increased marginal water price will result in the rational water consumers actually having to pay less for their tap water. Since it has already been established that water consumption is increasing with the family income, it can be assumed that the effect of the free supply will yield the desired social correction*"[23].

Instead of using this partial and rather intuitive approach, it is recommended to calculate the distributive effects for a (large) number of *existing* families, starting from a representative cross-section of the Flemish population. These effects can then be extrapolated and summarised for sub-groups of the whole population (see paragraph 3.4).

The required data must allow us to establish a relation between the water consumption of a household, the family income and the number of family members. Since the water companies have compensated for the losses caused by the free supply of 15 m3 per person

[22] See e.g. Decoster, A., S. Proost and E. Schokkaert. *Reform of indirect taxes: winners and losers*. In Leuvense Economische Standpunten 1992/63, May1992; Decoster and Van Dongen, 1994.
[23] VI.P., 1996-1997, 428/1, p. 16.

by charging higher marginal tariffs, it is necessary to have information on the drinking-water price before and after the introduction of the new regulation as well.

3.2 Data used

3.2.1 1995-1996 NIS family budget survey

The basic data for the analysis have been taken from the most recent family budget survey of the National Institute for Statistics (NIS). The survey took place between 1 June 1995 and 31 May 1996. These data allows us to establish a relation between water consumption and several family characteristics such as the income and the family size.

A family budget survey is a statistical investigation into the size and the composition of the family incomes and expenses. The 1995-1996 survey was held among 3,422 families in Belgium, 2,724 of which finally continued to cooperate until the survey was completed and whose data were retained for the calculation of the results. For the Flemish Region 1,231 families were retained.

During the sample survey, the main objective was to obtain the most representative sample of the Belgian population, with respect to the Region, the professional status, the number of family members and the age of the reference person. On the basis of these characteristics, the families were subdivided into a number of categories. For each category the NIS calculated an extrapolation coefficient. This coefficient is equal to the ratio between the number of families in the population and the number of families in the sample survey. These weighting coefficients allow the extrapolation of the individual family budget data to the total population.

The data obtained from such surveys are used e.g. for the determination of a weighting scheme for the index of the consumption prices and for numerous macro-economic studies. In this paper the data on the *Flemish* families, resulting from the family budget survey, are used. The data on the general family characteristics (family size, address, income, etc.) and on their water consumption are especially relevant.

3.2.2 Drinking-water tariffs

A second database contains the tariffs for the drinking-water supply. The NIS-survey does not ask for any information on the water consumption volume. Only the expenses are registered. However, for the calculation of the wastewater charge, it is necessary to know the water consumption expressed in m3. This must be calculated by dividing the expenses for water consumption for each of the individual families in the survey by the tariff they were

charged. Since the drinking-water prices and tariff structures differ from company to company, all the tariffs charged by the different water companies were solicited (see annex).

The new drinking-water tariffs were obtained from the water companies and from the general inspection of prices and competition (Ministry of Economic Affairs). Indeed, it has been pointed out that an important effect of the free supply of 15m3 of drinking-water per person is that the water companies compensate this loss of income by charging higher marginal tariffs (higher tariffs per m3 of drinking-water consumption).

3.3 Adaptation and reliability of the data

In order to calculate the distributive effects, some conversions of the basic data described above are necessary.

3.3.1 Calculation of the drinking-water consumption and the drinking-water expenses

As has been mentioned above, the data of the water companies need to be related to the data of the NIS for the calculation of the water consumption in m3 per family from the budget survey.

For each of the individual families in the budget survey, water consumption can be calculated by dividing their water expenses by the tariff they were charged during the period in which the survey sample was taken (taking into account possible fixed charges and/or free quantity of water). The drinking-water prices and the tariff structures differ from one company to another, and within certain companies from municipality to municipality. Since the general family characteristics in the survey include the postal code of the family's residence, the calculation of their water consumption will not give rise to any particular problems for the majority of the families. More specifically, the water consumption of each family was calculated using the drinking-water tariffs for the year 1995. The obtained figure for water consumption was then again converted to expenses by applying the tariffs for the year 1996.

Still, some families live in a municipality that does not entirely fall within the service sector of one particular drinking-water company. The tariffs we used in the calculations for these municipalities were those of the water company with the highest number of subscribers in the municipality. When the number of customers was practically the same, a weighted average was used.

The tariff structure of the Antwerp Water Company (Antwerpse Waterwerken or AWW) constitutes another problem. The majority of the domestic customers of this company pay a drinking-water price that is calculated on the basis of a fixed tariff that depends on

approximately 60 technical parameters. However, this fixed tariff cannot be used for the calculation of water consumption in the family budget survey. So, the water consumption of these families had to be calculated differently. This was done by applying the stipulations of the law concerning the pollution of surface waters. In this law, the wastewater charge is determined through an approximation: if the invoices of the drinking-water companies do not mention water consumption, water consumption is obtained by dividing total water expenses of the particular household, VAT excluded, by 40.

3.3.2 Deleted families and recalculation of the weighting coefficients

Families with a zero consumption

A number of surveyed families did not submit any water consumption expenses (196 families in the Flemish Region or 16% of the total sample survey). It is indeed possible that no invoice was made up during the period of the family budget survey, due to variations in the registration periods of the distribution companies. Beside, it can also be assumed that some of these families will have their water consumption expenses included in the rent of their houses. Finally, it is possible that no tap water was consumed, and that the families concerned use well and rain water. However, the data from the family budget survey do not make it possible to trace the real water consumption of these families. Therefore, the families with a zero consumption were removed from the database. Including the data of these families in the database, would distort the results considerably.

Families with combined expenses

In the family budget survey, the water consumption expenses are included in other expenses for 233 out of the remaining 1,035 families. These families' water consumption is invoiced together with their expenses for electricity, gas and/or cable television. The NIS had planned to split these expenses when visiting the participating families, but due to circumstances, this was not always done. Also for these families with combined expenses, it is impossible to trace the real water expenses. They were also removed from the database.

Families with a very low water consumption

Some of the remaining families from the family budget survey filled out very low expenses for tap water consumption (11 BEF, 69 BEF, …). These families may have moved during the period when the family budget survey was taken, which then resulted in water invoices that only cover a limited time period. Anyhow, these families were removed from the database as well, again to avoid too much distortion. In short, all the families with water consumption expenses below the fixed charge applicable in the municipality concerned, were removed. This concerns a total of 23 families.

Families with a high water consumption

Finally, the sample survey contains a number of families with very high water consumption expenses (up to 3.5 million BEF). In conformity with the wastewater charge definition of small consumers, the break off limit was determined at 500 m3 of water consumption. The 10 families with a calculated higher consumption were removed from the database. It appears that these are mainly families whose reference person is a self-employed person.

Recalculation of the extrapolation coefficients

In all, 462 families were removed from the sample survey: 196 families with a zero consumption, 233 with combined expenses, 23 with expenses below the fixed charge and 10 with a water consumption over 500 m3. For each of the remaining 769 families, the weighting coefficients were recalculated on the basis of the method used by the NIS. In other words, it is assumed that the deleted families, classified according to the parameters of professional status, number of family members and reference person age, show the same characteristics as the remaining families as to water consumption and income. Removing a number of families from the budget survey, decreases the scope and the representativity of the sample survey, but was necessary to avoid considerable distortions in the results.

3.3.3 New drinking-water tariffs

Upon the introduction of the new measures, it was assumed that the price for the additional tap water supplied would increase substantially as a consequence of the obligation to supply a minimum quantity of tap water free of charge. This price effect, it was claimed, is even required in order to bring about the desired social effect: if the losses caused by the free supply were calculated into the amount of the invoiced water, they will be paid by the families with a high water consumption, who (from a statistical point of view) are also the families with the higher incomes[24].

The information obtained from the waterdistribution companies shows that the tariffs for domestic drinkingwater consumption have indeed increased considerably. However, it is worth considering the following observations.

Application problems in 1997

The 1997 program decree, approved by the Flemish Parliament on 20 December 1996, stipulated that the water companies must supply a free quantity of tap water equal to 15 m^3 per person every year, *as of 1 January 1997*. However, the price increases that are necessary to compensate for the losses suffered due to the free supply, must be submitted

[24] Vl.P., 1996-1997, 428/1, p. 16.

for approval to the General Inspection of the Prices and the Competition of the federal Ministry of Economic Affairs (price commission). This commission has 60 days to decide. The requested price increases may only be effectively applied after notification of the decision. Consequently, the new prices could not have entered into force on 1 January 1997. Moreover, several companies were not ready to submit their applications. Besides, it is very rare that the invoice period of the distribution companies coincides with a calendar year.

The various distribution companies reacted in different ways to these problems. A number of companies wanted to supply 15 m3 per person free of charge as of 1 January 1997. The price increase for those companies depended on the date the new tariffs would become effective. The tariffs for 1997 were considerably higher than the proposed "normal" tariff that would go into effect as of 1998, because the expenses made in the first months of 1997 had to be recovered from the remaining months in which the new prices would become effective[25]. Other companies decided they would supply the free 15 m3 per person from the moment the new prices could be applied. In the preceding period the former tariffs would be maintained[26]. Still other companies did not wish to start with the real adjustment until 1 January 1998[27]. They refer to the explanatory memorandum of the Flemish government which states that, in principle, the first free supply will be calculated into the first invoice for additional water consumption in the year 1998[28].

The first price reforms were approved by the price commission in March 1997. On 1 July 1997, several applications still had to be submitted[29]. For the year 1997, all this resulted in a complex situation in which different transition periods, systems and interpretations co-existed. This transitional situation was not taken into account for the further calculations. The new regulation will be applied in the same way by all companies, from 1 January 1998 on. So the calculations were based on the tariffs that are applicable in 1998.

---

[25] The municipality of Middelkerke e.g. requested a tariff per m3 of 80 BEF as of 1998. The requested tariff for 1997 varied from 92 BEF (if the new prices would become effective on 1 April 1997) to 131 BEF (commencing date 1 August 1997).

[26] The Provinciale en Intercommunale Drinkwatermaatschappij der Provincie Antwerpen (PIDPA) e.g. wished to supply 6 m3 per family free until and including March 1997 (i.e. the previous free 24m3 per year multiplied by 3/12) and 15 m3 per person free as of April 1997.

[27] For the 1997 invoices, the Vlaamse Maatschappij voor Watervoorziening (VMW) e.g. still charges 0 BEF for the tariff bracket from 0 to 24m³. As of 1 January 1998, this tariff bracket is abolished and the free supply of 15 m3 per person is applied.

[28] Vl.P., 1996-1997, 428/1, p. 16; and Vl.P., 1996-1997, 428/18, p. 9.

[29] From the applications that are evaluated until now, we learn that applications, in which the price increase depends upon the date the new tariffs will become effective, are not accepted. Instead, the proposed "normal" tariffs that would become effective as from 1998, are approved.

Causes of the price increase

When 1996 is compared with 1998, the increase of the marginal water prices is sharp for almost each company: from 22% to 122%[30]. In Flanders the marginal tariff (incl. VAT), weighted with respect to the number of inhabitants per municipality, rises on average from approximately 40 BEF per m3 in 1996 to 60 BEF per m3 in 1998 (+ 50%), see also chart 10 paragraph 4.2.2.

These price increases can be attributed to four main factors. First there is the free supply of 15 m3 *per person*. This entails a loss for the water companies because this volume exceeds the former free supply of drinking-water *per family* in some regions (see annex). Second, the free supply results in extra administrative expenses. Indeed, every year the databases have to be updated according to the new family situations communicated by the municipalities. Third, as from 1997, the water companies must pay a groundwater tax of 3 BEF per m3 of pumped water. This extra cost is also passed on to the customer. Finally, most companies expect a decrease in water consumption as a consequence of the increased tariffs. The higher costs have to be recouped on a smaller volume, which causes a further increase of the tariffs. These factors must be reckoned with beside the 'normal' price increases which have undoubtedly taken place as well.

The first two of these factors and partly also the fourth, are directly related to the price reform. The groundwater tax and the possible increases in traditional price constituents (e.g. labour costs, capital charges, running costs, …) are not. However, in the analysis of the distributive effects, the actual prices were used for the calculations, i.e. including tariff increases as a result of the groundwater tax and other factors. Isolating the part of the tariff increase caused by the groundwater tax and other factors, requires a detailed insight in the costs and the tariff policy of the different water companies. This is not available. Moreover, including the part of the price increase that is due to the groundwater tax and other factors, does not necessarily have a negative influence on the outcome of our evaluation of the new regulation. If the hypothesis is correct that increasing marginal water tariffs result in social advantages, the groundwater tax will reinforce the desired social effect.

Adjustment for extra costs

In the Flemish Parliament, the Minister for the Environment stated that the companies would include the extra costs resulting from the free supply in the invoice for domestic water consumption, more specifically in the bracket of up to 500 m³ per year[31]. This corresponds with the limit of minor consumption in the wastewater charge regulation. In this way, it would

[30] The Antwerpse Waterwerken are an exception to that rule. Their tariff per m3 increases with only 3%. This is to be explained by the sharply deviating tariff structure and costs recuperation compared to other companies.
[31] Vl.P., 1996-1997, 428/18, p. 4.

be guaranteed that the compensation remains within domestic consumption and is not passed on to industrial companies[32].

However, the water companies use different definitions of domestic consumption. From the price applications that were submitted to the Ministry of Economic Affairs it appears that a number of companies compensate for the costs resulting from the free supply by applying tariff increases in the bracket up to 1,000 m3. This means that the consumption of many self-employed persons and small to medium-sized companies was included for the price calculation[33].

Still, the calculations in this paper are based on the price increases as requested and/or approved. If every company were indeed to compensate for the extra costs in the bracket up to 500 m3, some tariffs would be higher. Again, it can be assumed that this would reinforce the desired social effect, if the hypothesis that increasing marginal water tariffs yield social advantages is correct.

3.3.4 Reliability of the figures used

The adaptations of the basic data were aimed at improving the reliability of the sample survey. However, a crucial question remains, i.e. whether the data obtained after the described adaptations constitute a good starting point for assessing the distributive effects.

Here two questions are essential. First, are our estimates of the water consumption confirmed by other sources? Second, is the sample survey representative, i.e. can the calculation results be used to draw conclusions for the whole Flemish population?

Water consumption

The figures of the NIS family budget survey yield an average water consumption of 108 m3 per family per year, and 115 litre per person per day. The average consumption per family increases with income and family size, while the average consumption per person decreases with an increase in family members (see charts 1 and 2). This downward trend points to economies of scale for larger families. The downward trend in the average water consumption per person with increasing income, proves that families with higher incomes are on average also larger families.

See CHART 1
See CHART 2

[32] VI.P., 1996-1997, 428/18, p. 8.

[33] See Janssens, I., M. Van Mol and D. D'hont, *Water supply*. Environment and nature report Flanders1996. Scientific report. Mechelen, Flemish Society for the Environment, 1996, p. 7.

The tables 3.4. and 3.5. combine the relation that was found in the family budget survey between water consumption, income and family size. Consumption per family generally increases with the number of family members and the income. Consumption per person generally decreases with increasing family size and decreasing income.

Table 3.4. Average water consumption per family (m3 per year): 108

number of family members decile	*1*	*2*	*3*	*4 and more*
1-3	56	83	124	159
4-6	95	88	132	155
7-10	113	107	127	149

Table 3.5. Average water consumption per person (litre per day): 115

number of family members decile	*1*	*2*	*3*	*4 and more*
1-3	153	114	113	99
4-6	259	121	121	95
7-10	309	146	116	92

These results are confirmed by the literature. The average water consumption calculated per person and per family corresponds closely with the figures papered elsewhere for Flanders[34]. The positive relation that was found between water consumption and income, respectively family size, is also confirmed[35]. The estimates obtained for water consumption are therefore quite reliable.

In this context it is also worth mentioning that the calculation of the water consumption per individual family (in most cases) could be done on the basis of the tariffs that were actually charged, since the municipality code of the family's residence was communicated by the NIS for each family. This is an important advantage compared to the our previous analysis in which weighted average tariffs per district had to be used for calculation[36], or compared to the MIRA studies that used the family budget survey for the analysis of the domestic water consumption and the distributive effects of the wastewater charge[37].

However, the conclusion that the water consumption estimates are quite reliable, is only valid for the *relative* figures (per family, per person). If all data are added up, this results in an overestimate of the water consumption. The total tap water consumption in Flanders,

[34] In e.g. SERV, 1993 and Janssens, I., M. Van Mol and D. D'hont, 1996.

[35] See SERV, 1993 and Janssens, I., M. Van Mol and D. D'hont, 1996.

[36] SERV, 1993.

[37] In Janssens, I., M. Van Mol and D. D'hont (1996) calculations per district were done using the average price that was found in the majority of the municipalities of the district. Decoster and Van Dongen (1994) used only one average price for Flanders that was applied to all families.

calculated using the data of the family budget survey, amounts to 245 million m3, while the actual consumption in the bracket up to 500m3/year is around 210 million m3[38]. This also results in an overestimate of the total drinking-water expenses, the revenue of the wastewater charge and so on.

This is due to the extrapolation coefficients. As described above, the families with a zero consumption were removed from the database and the weighting coefficients for each of the remaining families were recalculated. To the extent that the removed families are households that have their own water collection system, this results in an overestimate when making the sum of tap water consumption for the total Flemish population. For the analysis of the distributive effects this is not a major problem, since aggregate values are not used in the calculations. The water consumption and the distributive effects are calculated individually for each family from the family budget survey and these estimates appear to be reliable, as stated above. The extrapolation coefficients are not used for calculating the sum, but to weight the individual distributive effects. This means that our results are related to the part of the Flemish population that uses tap water, either entirely or to some extent. The results are not representative of families using well water only.

To conclude, it can be asserted that the family budget survey yields quite good estimates of the individual water consumption of the families that use tap water. However, the figures in this paper are neither meant for nor appropriate for drawing conclusions about families that use well water only, about the total water consumption in Flanders or the yields of the wastewater charge.

Representativity of the sample survey

An important question, both before and after the adaptations of the basic data, was whether the used sample survey is indeed representative and can be used for the analysis of the desired distributive effects.

This question may seem redundant at first since the NIS guarantees the representativity of the budget data. As described above, however, some adaptations of the basic data were necessary. We therefore examined the characteristics of the retained population in relation to the characteristics of the households in the original budget survey and found no substantial differences.

If only the distributive effects of wastewater charge had to be analysed, it would not be necessary to dwell further on this matter[39]. In Flanders as a whole, the same tax regulations and the same tax rates are applied, and starting from the calculated individual water

[38] Janssens, I., M. Van Mol and D. D'hont, 1996, p. 10..

[39] E.g. compare with SERV, 1993 and A. Decoster and H. Van Dongen, 1994.

consumption of the families, this allows a simple extrapolation of the obtained analysis results to the entire Flemish population[40].

However, this is not the case in an analysis of the distributive effects of the drinking-water price. Indeed, the increase of the drinking-water tariffs as a consequence of the reform may differ considerably from district to district. Ideally, the family budget survey should therefore also be representative as to the number of customers per water company. However, during the sample survey, the NIS did not explicitly allow for a specific regional distribution of the families, exception made for the distribution between the regions (Flanders/Walloon Region). This means that, if the family budget survey mainly contained families from districts with a relative small price increase e.g., the extrapolation of the situation of these families to the Flemish population (without further differentiation) could distort the results. Similar observations can be made if families from districts with sharp price increases would be relatively overrepresented.

A comparison between the real number of domestic subscribers belonging to the different water distribution companies and the number of families per company in the (adapted) family budget survey shows that companies charging the highest tariffs in 1998, are somewhat underrepresented in the survey. With respect to the growth in the prices as compared to 1995, the companies are more evenly distributed in the survey, though especially companies with a high price increase are relatively underrepresented while companies with a low price increase are relatively overrepresented. This implies the following for the calculation results.

- The absolute (BEF per family) and relative distributive effects (% of the income) for the current situation may be underestimated compared to the real effects;
- When comparing the distributive effects (both in an absolute and relative terms) in the previous and the current situation, the differences may be slightly underestimated;
- The consequences for the comparison of the distributive effects between different family types (families with a high versus low income, large families versus small families, …) cannot be determined in advance. Indeed, the effects depend on the relations between water consumption, water consumption expenses, income, family size and the like, i.e. of relations that need to be examined. If the hypothesis is correct that due to the free supply of 15 m3 of water per person and the higher marginal drinking-water tariffs, the current regulation is more favourable on the social level than the previous one, it is possible that the advantages of the reform are underestimated.

[40] Particularly to the section tap water consumers, see above.

3.4 Analysis of the distributive effects

An assessment of policy measures normally compares the situation before (i.e. the reference situation) with that after the policy change (i.e. the new situation). Three steps must be analysed:

1. Description of the reference situation: the assessment of the situation without the introduction of the policy measures;
2. Analysis of the new situation: the assessment of the situation after the introduction of the policy measures;
3. Analysis of the changes: the comparison of the reference situation with the new situation.

3.4.1 Description of the reference situation

In the reference situation the Ks factors continue to be applied, there is neither wastewater charge exemption for the underprivileged population groups nor a free supply of 15 m3 of drinking-water per person. The vertical and horizontal distributive effects in this situation are analysed.

As has been pointed out, vertical equity relates to purchasing power and income. In the analysis of a measure's purchasing power effects, the population is generally subdivided in income deciles, after which the effects are analysed per decile. A decile contains exactly 10% of the population (group).

Since a number of families have been deleted from the database (see paragraph 3.3.2), the NIS decile numbers, as indicated by the NIS, are not useful. Therefore, the remaining families from the sample survey were classified from low to high income and then, after weighting, using the (new) weighting factors, subdivided in 10 equal parts. Table 3.6. shows the income limits of the different deciles, obtained after recalculation of the results of the NIS family budget survey. Each decile contains exactly 227.328 families. The first decile contains the poorest 10% of the Flemish population, the tenth decile the richest 10%.

Subsequently, the averages of income, spendings, number of family members, water consumption, water consumption expenses, the amount of wastewater charge etc. were calculated per decile. Data on the average income, the average spendings and the average number of family members per decile, have been included in table 3.6. Other data will be discussed in detail furtherdown. The purchasing power effects of the former regulation are shown both in absolute and relative terms. In relative terms, they are expressed in per mills of spendings and income.

Table 3.6. Some characteristics of the families from the family budget survey per decile

decile	*Number of family members*	*Income limits*		*Average income*	*Average spendings*	*Average number of family members*
1	227,328	269,471	563,960	454,545	494,177	1.2
2	227,328	563,961	737,960	652,368	615,166	1.5
3	227,328	737,961	871,214	799,990	795,041	1.8
4	227,328	871,215	984,630	926,076	855,918	2.2
5	227,328	984,631	1,119,458	1,054,174	963,542	2.6
6	227,328	1,119,459	1,282,843	1,198,106	1,045,932	2.9
7	227,328	1,282,844	1,439,218	1,354,277	1,209,462	2.9
8	227,328	1,439,219	1,663,809	1,543,902	1,323,008	3.4
9	227,328	1,663,810	1,995,968	1,812,546	1,474,742	3.4
10	227,328	1,995,969	3,866,988	2,486,152	1,776,070	3.7

The horizontal distributive effects were calculated for families with different family sizes (from 1 to 7 and more persons). The families from the sample survey were classified for a second time, this time according to the number of family members. Furthermore, for each of these categories, averages were calculated for the income, spendings, the number of family members, water consumption, water consumption expenses, the amount of wastewater charge etc. Some of these data are presented in table 3.7. The horizontal distributive effects of the former regulation are also shown both in absolute and relative terms. In relative terms, they are expressed in per mills of the spendings and of the income.

Table 3.7. Some characteristics of the families from the family budget survey against family size

number of family members	*Number of families*	*average decile*	*Average income*	*Average spendings*
1	535,962	2	735,158	641,847
2	723,408	6	1,137,593	1,029,660
3	452,383	7	1,366,967	1,152,120
4	386,254	9	1,706,267	1,395,431
5	126,250	9	1,700,302	1,400,254
6	29,066	9	1,762,738	1,526,494
7 and more	19,959	8	1,591,837	1,442,789

It is important to note that all calculations were done starting from the individual families from the family budget survey. They were then converted to averages per decile or per family category, using the extrapolation coefficients.

This method yields more correct results compared with an analysis using calculations based on average values per decile or per family category. The following example will make this clear. When doing a calculation of the wastewater charge, using the 1996 formula based on the average water consumption per decile, the highest Ks factors are never applied. Indeed, there are no deciles with an average annual consumption that exceeds 200 m3. In the

individual budget data this amount of water consumption does, however, occur, which means that the calculation based on the micro data is more correct.

3.4.2 Description of the new situation

The new situation relates to the situation after the reform and is characterised by (1) the abolishment of the Ks factors in the wastewater charge, (2) the introduction of a wastewater charge exemption for underprivileged population groups, and (3) the free supply of 15 m3 of drinking-water per person.

For the description of this (current 1998) situation, exactly the same method is used as for the description of the reference situation. In other words, for the current situation too, a number of parameters are calculated per decile and per family category (water consumption, water consumption expenses, the amount of wastewater charge etc.) and the distributive effects are shown both in absolute and in relative terms. In relative terms they are expressed in per mills of the spendings and of the income.

The current situation only differs from the reference situation regarding the drinking-water and wastewater parameters. The other variables remained unchanged. In this way the comparison between the distributive effects of the previous and of the current situation is not affected by possible changes in e.g. incomes, family size or residence.

The formula for the wastewater charge as well as the new drinking-water tariffs are known. The change in water consumption, as a result of the modified tariffs, however is not[41]. Upon the introduction of the free supply of 15 m3 of drinking-water per person, it was assumed that this measure would lead to a more rational water consumption, but this was not quantified.

Price changes give rise to two effects: an income and a substitution effect. On the one hand, the total purchasing power may have changed: either the families can no longer buy the same goods and services with the same nominal income as before, or part of their income is not spent after they have bought the same goods and services. On the other hand, the relative prices may have changed so that certain goods and services have become relatively more expensive and the families prefer to replace them by other products. In normal cases, the income effect is positive while the price effect is negative: an income increase leads to a raise in consumption of the product, while a price increase of the product results in a decreased consumption. The impact of these effects is traditionally represented by elasticities. The income, resp. price elasticity indicate how consumption changes with respect to a fluctuation in the income resp. the price. A price elasticity of -0.5, for example, means that a price increase with 1% entails a consumption decrease of 0.5%.

In the further calculations, the income effect is not taken into account. It is indeed almost negligible because of the limited influence of the price changes on the part of the income that is spent (as an average less than 0.1%) in combination with the low income elasticity of drinking-water[42] and the short-term perspective of the analysis.

The price effect is more important. If water consumption does not change, the drinking-water invoice for certain families will be much higher (in other words the average price is increasing) and, the marginal drinking-water tariffs increase considerably almost everywhere. Moreover, water consumption is price-sensitive. The chart below shows, by way of illustration, the relation between the average drinking-water price and the average water consumption per family and per person, obtained on the basis of the family budget survey. *Higher prices appear to correspond with a considerably lower average for consumption*.

CHART 3

However, this relation is a *long-term effect*: the consumers have adapted to the price structure. In the short term, the price elasticity of the demand for tap water is rather small, as has been demonstrated by various studies[43]. As a consequence, in the short term, price elasticity related to the demand for tap water is rather limited, which means that the effect of the price increases on the water consumption volume should not be overestimated.

In the description of the current situation, it is assumed that the water consumption of the families varies as a result of the price changes. In the calculation, we used three values for the price elasticity of the demand for drinking-water: -0.05 for a family consumption under 30m3 per year, -0.3 for a consumption under 120 m3 and -0.4 for a consumption over 120 m3. This indicates that minor quantities of drinking-water are a life-necessity (beverages, preparation of meals, …). The price elasticity for other types of water consumption, such as laundry, personal hygiene and toilet flush, is higher, and for yet other types of consumption higher still. For the calculation of the actual volume of water consumption per individual family, the above elasticities were applied to the average drinking-water price because this turned out to be statistically more relevant than the marginal price. Moreover, the elasticities were only applied in case of price increases. In other words, in our model a decrease in price does not yield an increase in water consumption. In addition, some other (higher and lower) values for the price elasticity were calculated as well (sensitivity analysis). The results of these calculations are not analysed in detail in this paper.

---

[41] It is clear that water consumption can also change due to other factors (see Janssens, I., M. Van Mol and D. D'hont, 1996). Here they are kept constant.

[42] See e.g. SERV, 1993 and Janssens, I., M. Van Mol and D. D'hont, 1996.

[43] See e.g. SERV, 1993 and Janssens, I., M. Van Mol and D. D'hont, 1996.

3.4.3 Analysis of the changes

The last step in the analysis is the comparison of the reference situation with the current situation. Here the vertical and horizontal distributive effects of both situations are compared with one another, and the winners and the losers are determined.

Since the differences between the distributive effects in the new and the former situation result from different factors, the results are shown in a number of intermediary steps. They offer an insight into the explanation of the differences. The different intermediary steps are schematically represented in table 3.8..

Table 3.8. Steps in the analysis of the distributive effects

Step	*Social correction wastewater charge*	*Measure drinking-water*	*Tax tariff (BEF) (year)*	*Water tariffs (year)*	*Water consumption (price elasticity)*
1 (refsit)	Ks	none	980 (1997)	1996	= 0
2	No	none	980 (1997)	-	-
3	No	none	1005 (1998)	-	-
4	No	15m3pp	1005 (1998)	1998	= 0
5 (nwsit)	No	15m3pp	1005 (1998)	1998	<> 0
** 6*	Exempt. Soc. Inc.				

The step-by-step analysis does not only offer a better insight into the explanation of the results, but also allows an independent evaluation of the current situation with respect to the wastewater charge and the drinking-water invoice. In other words, in the conclusions, a difference can be made between the current situation, considering the wastewater charge only, and the current situation considering the overall reform, i.e. including the measure within the framework of the drinking-water supply.

4. RESULTS

4.1 Former situation (reference situation)

4.1.1 Distributive effects of the reference situation (step 1)

The reference situation is the situation that would have arisen if the former regulation had continued to be applied in 1997 and 1998. The rate of the wastewater charge then amounts to 980 BEF. The drinking-water prices do not change compared to the year 1996.

Vertical distributive effects

Table 4.1. shows the absolute and relative vertical distributive impacts of the wastewater charge, the drinking-water prices and the total expenses (wastewater + drinking-water) in the former situation. Up to and including the sixth decile, the average charge amount per family increases with increasing income. The lower deciles definitely pay less wastewater charge, on average, than the higher deciles. This corresponds with the relation found between water consumption and income (see chart 1). The expenses for drinking-water show a similar tendency. However, the amounts are considerably higher than for the wastewater charge: on average almost 3 times higher. Logically, the conclusions for the total sum of the drinking-water and wastewater expenses in function of income are the same.

Table 4.1. Vertical distributive effects reference situation

Decile	*Charge (BEF)*	*Water (BEF)*	*Total (BEF)*	*Charge/ Income 0/00*	*Charge/ Spendings 0/00*	*Total/ Income 0/00*	*Total/ Spendings 0/00*
1	848	2811	3660	1.82	1.65	8.03	7.34
2	953	3208	4161	1.49	1.64	6.48	7.15
3	1088	3377	4465	1.37	1.38	5.60	5.86
4	1415	4061	5476	1.53	1.69	5.93	6.56
5	1630	4475	6105	1.54	1.69	5.79	6.41
6	2112	5052	7164	1.76	2.21	5.97	7.39
7	1936	4850	6786	1.43	1.68	5.01	5.86
8	2067	5305	7372	1.34	1.61	4.78	5.79
9	2361	6123	8485	1.31	1.61	4.71	5.85
10	2201	5432	7633	0.87	1.36	3.08	4.71

The charges weigh more heavily on the income of the first decile, i.e. in the tenth part of the Flemish population with the lowest income, and weigh the least on the highest decile, still, the purchasing powers obtained for the different deciles practically equal one another. Expressed in per mills of the total family expenses (spendings) this is even more apparent, because the purchasing power effects are then lower for the poorer families and higher for the richer families. This is due to the fact that the family spendings do not evolve in the same way as the family income. As the income increases, a smaller part of it is spent on purchasing goods and services. The purchasing power effects of the total water invoice are not only much higher, but are also distributed more regressively over the different deciles. The total expenses in proportion to the income are especially important for the two lowest deciles. This difference between the purchasing power effects of the wastewater charge and of the total water invoice are a clear indication that the Ks factors have had a certain correcting effect. This will be explained in detail, later in this paper.

Horizontal distributive effects

Table 4.2. contains the horizontal distributive impacts in the reference situation. The amount of wastewater charge as well as the drinking-water invoice and the total water invoice increase with an increasing number of family members. The expenses of families of 7 persons or more, however, on average turn out to be under the level of families of 6 persons. Here too, the evolution is explained by the average water consumption level (see chart 2). Considered in function of income, the purchasing power effects of the wastewater charge increase for larger families. This effect is even more apparent when these expenses are expressed in per mills of the spendings. The increase is slightly less sharp for the expenses for drinking-water, which entails that the purchasing power effects of the total water invoice increase slightly less with the family size, compared to the wastewater charge.

Table 4.2. Horizontal distributive effects reference situation

Number of family members	*Tax (BEF)*	*Water (BEF)*	*Total (BEF)*	*Tax/ Income 0/00*	*Tax/ spendings 0/00*	*Total/ Income 0/00*	*Total/ Spendings 0/00*
1	881	2910	3791	1.24	1.47	5.60	6.41
2	1250	3960	5210	1.19	1.28	5.05	5.49
3	2058	5242	7301	1.80	1.99	6.27	7.00
4	2234	5451	7685	1.44	1.74	4.93	5.98
5	3181	6409	9590	2.11	2.57	6.27	7.62
6	4588	10087	14675	2.88	3.23	8.96	10.15
7 and more	3541	7853	11393	2.10	2.46	6.94	8.04

4.1.2 Effectiveness of the previous social correction (steps 2 and 3)

By abolishing the Ks factors a tax formula without social correction is obtained. In this paragraph, this situation is compared with the reference situation. In this way, the social effectiveness of the previous social correction can be determined, or conversely, the consequences of the abolition of the Ks factors can be demonstrated, supposing no new regulation is introduced either for the wastewater charge, or for the drinking-water supply.

Compared to the previous tables, abolishing the Ks factors leads to the wastewater charge increases for all families. The drinking-water expenses remain the same.

Vertical distributive effects

Chart 4 shows the vertical distributive impacts of the wastewater charge in function of income. For the lowest line, the charge was calculated using the Ks factors and a tariff of 980 BEF. The upper lines show the charge without social correction, calculated at a tariff of 980 BEF resp. 1,005 BEF. The first tariff is the 1997 tax tariff, the second is the 1988 tariff (index increase of 2.5%).

CHART 4

The chart confirms that the charge, with application of the former social correction (Ks factors), shows a slightly regressive impact on the incomes distribution on the whole, but the differences, when comparing the separate deciles, are not very big. However, these differences are important for the charge without social correction. The impact of the latter is much more explicitly regressive. Apart from the fact that not only the most affected population groups, but all families have to pay less in the tax regulation using Ks factors, the previous social correction system is indeed efficient on this point.

This is a remarkable result. A study, ordered by MIRA 1, and based on the data from the 1987-1988 family budget survey, concluded that the social correction did not have any impact on the regressive character of the charge without correction, and that the term social correction was therefore in fact rather inappropriate because all the deciles enjoyed this tax reduction to the same extent[44]. As is shown in the official parliament documents, the decision to abolish the Ks factors, taken by the Minister for the Environment, was based on this conclusion[45]. The SERV had already compared different systems for the social correction of the wastewater charge with one another on a previous occasion, starting from the data of the 1987-1988 family budget survey[46]. At that time, the SERV conclusions differed slightly from those of the MIRA study, in that the Ks factors were seen to have a certain levelling effect (with respect to the other deciles, the lowest deciles paid relatively less than under a tax system without social correction, while the highest deciles paid relatively more), though that this social correction was insufficient to compensate entirely for the regressive impact on the lowest decile[47]. In other words, the results obtained by using the updated data correspond with the earlier SERV conclusions.

A tax tariff increase does not only yield higher nominal tax amounts for the different families, but also causes a higher regressivity in the charge without correction, as shown in chart 4. Considering the minor tariff increase (from 980 up to 1,005 BEF), the social effects are also limited.

Chart 5 represents the vertical distributive impacts of the total water invoice against the income. The regressivity of these expenses is confirmed, both when the Ks factors are applied (lowest line) and when the Ks factors are abolished (lines above). Indeed, as was pointed out, the expenses for drinking-water are much higher than the amount of wastewater

[44] A. Decoster and H. Van Dongen, 1994, p. 12 and p. 50-51.
[45] VI.P., 1996-1997, 428/18.
[46] SERV, 1993. The basic data of this SERV study were the same as these used by Decoster and Van Dongen, though the applied methodology was different. Perhaps the most important difference is, that in the SERV study, average drinking-water tariffs per district were used to calculate the water consumption of the individual families, while Decoster and Van Dongen applied one and the same tariff for the whole of Flanders. Also see paragraph 3.3.4.
[47] SERV, 1993, p. 11 and 47-48.

charge and the social impact of these expenses increases with lower incomes. The social correction for the wastewater charge can hardly compensate for these effects.

CHART 5

Horizontal distributive effects

The horizontal distributive impacts of the wastewater charge with and without social correction are compared with one another in chart 6. In both cases, the purchasing power effects increase considerably for large families (from 5 persons up). For the charge with social correction, this effect is more important than for the charge without social correction. This result is also in line with the earlier SERV calculations. It was concluded then that the Ks factors scored badly with respect to the parameter reckoning with the family size[48]. The explanation is that water consumption increases with family size and that the Ks factors yielded higher charges in case of a high family consumption. Here, the increase of the wastewater charge tariff has only a nominal effect. It does not have any consequences for the relative horizontal distributive effects.

CHART 6

Chart 7 represents the horizontal distributive effects of the total water invoice against the income. The conclusions are the same as above. The purchasing power effects increase drastically for large families (from 5 persons up) and the Ks factors reinforce this effect.

CHART 7

Conclusion

Our earlier findings in SERV (1993) are confirmed by the new calculations. The previous social correction had a certain levelling impact on the regressivity of the wastewater charge without social correction, but yielded bad results with respect to the criterion of horizontal equity. However, with respect to the vertical distributive effects, the results seem to be better than was first estimated on the basis of the data from the 1987-1998 family budget survey.

As a consequence, the abolition of the Ks factors in the wastewater charge leads, first of all, to a *deterioration of the relative position of the poorer families*. Still in relative terms, the *larger families* are slightly better off, but the *benefit is limited*. In nominal terms, all families are worse off. An increase of the tax tariffs reinforces these tendencies. It should be

[48] SERV, 1993, p. 11 and 48.

mentioned that this intermediary conclusion is slightly modified when the influence of the tax exemption for certain categories of social incomes is taken into account (see paragraph 4.4.)

If the *overall* new regulation proves to be socially efficient, it should rectify the negative distributive effect resulting from the abolition of the Ks factors and convert it into a positive distributive effect. This will be examined below.

4.2 New situation (current 1998 situation)

In the new situation, after the reform, all families receive 15 m3 of drinking-water per person free of charge, but they are confronted with higher marginal drinking-water tariffs. First, the distributive effects are examined in the case that water consumption per family does not change. Later, the effects are calculated on the basis of the hypothesis that water consumption will decrease as a result of the higher tariffs. It is worth noting that in this paragraph, the tax exemption for certain categories of social incomes was not taken into account. Its influence on the conclusions will be examined later (see paragraph 4.4.)

4.2.1 Water consumption volume remains unchanged (step 4)

Tables 4.3. and 4.4. show the vertical and horizontal effects of the current situation for the hypothesis that water consumption does not change. In this case, the tax amount is the same as in the situation where a tariff of 1,005 BEF is charged, described above. It is in line with the relation between water consumption and income resp. family size, determined before. The horizontal and vertical distributive impacts of the wastewater charge, consequently, are the same as the ones shown in the charts 4 and 6 (tax system without Ks, tariff 1,005).

The curve of the drinking-water expenses shows a similar course as the wastewater expenses curve. On average, they increase with income per family (up to and including the sixth decile) and with family size (up to six persons). Drinking-water payments remain considerably higher than the wastewater charge: on average slightly less than 2 times higher. The total drinking-water and wastewater expenses naturally show the same development with respect to income and family size.

Table 4.3. Vertical distributive effects current situation (E=0)

Decile	*Tax (BEF)*	*Water (BEF)*	*Total (BEF)*	*Tax/ Income 0/00*	*Tax/ spendings 0/00*	*Total/ income 0/00*	*Total/ Spendings 0/00*
1	1579	3677	5256	3.45	3.19	11.62	10.71
2	1798	3843	5641	2.79	3.07	8.79	9.71
3	2055	4176	6231	2.58	2.66	7.83	8.23
4	2482	4773	7255	2.69	2.98	7.86	8.71
5	2716	4999	7715	2.57	2.87	7.32	8.09
6	3240	5762	9002	2.70	3.36	7.49	9.40
7	3143	5606	8750	2.32	2.71	6.46	7.52
8	3291	5600	8891	2.13	2.58	5.76	6.97
9	3534	6488	10022	1.96	2.45	5.56	6.88
10	3279	5568	8847	1.32	2.03	3.55	5.46

Table 4.4. Horizontal distributive effects current situation (E=0)

Number of family members	*Tax (BEF)*	*Water (BEF)*	*Total (BEF)*	*Tax/ Income 0/00*	*Tax/ spendings 0/00*	*Total/ income 0/00*	*Total/ Spendings 0/00*
1	1661	3869	5530	2.44	2.81	8.25	9.41
2	2336	4708	7044	2.25	2.44	6.81	7.38
3	3222	5881	9103	2.80	3.12	7.87	8.74
4	3429	5436	8866	2.22	2.69	5.71	6.91
5	4290	6588	10878	2.83	3.44	7.14	8.69
6	5716	9835	15552	3.58	4.05	9.56	10.75
7 and more	4734	6093	10827	2.91	3.34	6.36	7.56

In relative terms, the total expenses clearly weigh more heavily on the income of the two lowest deciles, i.e. on the fifth part of the Flemish population with the lowest income. Considered over all the deciles, the impact is, moreover, regressive: purchasing power effects, both in function of income and of spendings, increase for the lower incomes. This is partly due to the strong regressive impact of the wastewater charge on the incomes distribution, but apparently, the new drinking-water expenses have a rather regressive distributive impact as well.

This is confirmed in chart 8. This chart represents the vertical distributive effects of the drinking-water expenses (water 1998, E=0) in function of income. These effects have a clear regressive distributive impact over the various income deciles. Furthermore, the chart compares the total expenses obtained in step 3 (no Ks, tax tariff 1,005 BEF) with the total expenses in the current situation (without changes in consumer behaviour, price elasticity E=0). The new regulation clearly scores worse. The purchasing power effects are not only higher, also regressivity is stronger. Both in relative terms and in comparison with the other deciles, the lowest income deciles are worse off.

CHART 8.

As to the relative horizontal distributive effects, the current situation, compared to a situation without social correction for the wastewater charge (see step 3), yields positive results. This is shown in chart 9. Compared to smaller families, larger families have more advantages in the current situation, and in nominal terms, the largest families (6 persons and more) also pay less on average than in a situation without social correction for the wastewater charge.

CHART 9

4.2.2 Water consumption volume decreases (step 5)

As has been pointed out above, all over Flanders, the *marginal* drinking-water tariffs increase considerably (also) as a consequence of the free supply of 15m3 per person. Chart 10 illustrates the amount of increase. The chart shows the evolution of the marginal drinking-water price and of the wastewater charge tariff between 1992 and 1998. It is an average value for Flanders, calculated on the basis of the tariff per company, weighted in function of the company's number of domestic subscribers. Between 1992 and 1996, this price slightly increased every year, but for the period 1997-1998 the increase is very sharp. Moreover, for quite a number of families the *average* tariff increases as well. This was illustrated above in paragraph 3.1. Below, it is assumed that an increase in the drinking-water price results in a decrease in drinking-water consumption (price elasticity E<>0). The methodology and parameters used, were described above (see paragraph 3.4.2).

CHART 10

The decrease in drinking-water consumption has effects on the nominal amounts mainly (see tables 4.5. and 4.6.). Both the charge that is due and the drinking-water invoice are on average lower for all household categories than in the situation without changes in consumer behaviour. Beside this, there are not a lot of changes. The expenses still increase with income (up to and including the sixth decile) and with family size (up to six persons). These expenses weigh rather heavily on the income of the two lowest deciles. The regressivity has slightly diminished but remains clearly present. This is shown in chart 11, which gives a comparison of the vertical distributive impacts in the situations with and without a decreasing water consumption.

Table 4.5. Vertical distributive effects current situation (E<>0)

Decile	*Tax (BEF)*	*Water (BEF)*	*Total (BEF)*	*Tax/ Income 0/00*	*Tax/ spendings 0/00*	*Total/ income 0/00*	*Total/ Spendings 0/00*
1	1423	3339	4762	3.11	2.89	10.54	9.76
2	1641	3513	5154	2.54	2.80	8.02	8.86
3	1832	3716	5547	2.29	2.38	6.96	7.35
4	2266	4327	6593	2.45	2.71	7.13	7.89
5	2506	4557	7063	2.38	2.65	6.71	7.43
6	2963	5190	8153	2.47	3.04	6.79	8.43
7	2885	5073	7958	2.13	2.49	5.87	6.83
8	3074	5125	8198	1.99	2.42	5.31	6.46
9	3324	5965	9289	1.84	2.31	5.15	6.40
10	3100	5190	8290	1.25	1.92	3.35	5.14

Table 4.6. Horizontal distributive effects current situation (E<>0)

Number of family members	*Tax (BEF)*	*Water (BEF)*	*Total (BEF)*	*Tax/ Income 0/00*	*Tax/ spendings 0/00*	*Total/ income 0/00*	*Total/ Spendings 0/00*
1	1458	3444	4902	2.15	2.48	7.36	8.39
2	2129	4262	6391	2.05	2.24	6.20	6.74
3	2966	5328	8294	2.57	2.87	7.16	7.98
4	3263	5073	8336	2.11	2.56	5.37	6.50
5	4031	6069	10100	2.64	3.21	6.58	8.00
6	5582	9503	15085	3.49	3.94	9.25	10.42
7 and more	4593	5748	10341	2.85	3.25	6.16	7.26

CHART 11

For the horizontal distributive effects, the situation is just the opposite. Behaviour effects (a decrease in water consumption) weaken the relative advantage of the larger families in the current situation (see chart 12).

CHART 12

4.2.3 Elasticity sensitivity analysis

For the analysis of the distributive effects in the current situation, the following values were used for the price elasticity of the demand for drinking-water: -0.05 for a family consumption under 30m3 per year, -0.3 for a consumption under 120 m3 and -0.4 for a consumption over 120 m3. As has been pointed out, compared to the situation without behaviour effects, a decrease in water consumption has three consequences:

- The nominal amounts for wastewater, drinking-water and total expenses decrease for all family categories.

- The picture of the relative distributive effects in per mills of the income or of the spendings hardly changes for the different deciles. The distribution of the wastewater expenses, drinking-water expenses and the total expenses remains regressive and weighs rather heavily on the incomes of the two lowest deciles especially. All in all, regressivity does not decrease noticeably.
- When comparing families of different sizes, the picture of the horizontal distributive effects in per mills of the income or of the spendings, does not change significantly either. The decrease in water consumption weakens the relative advantage of the larger families in the current regulation to a limited extent.

This is the same for other values in the price elasticity of the demand for drinking-water. Charts 13 and 14 illustrate this for the drinking-water invoice. Even a sharp decrease in drinking-water consumption (price elasticity E= -1) does not change the general course of the curves. With increasing price sensitivity, the lines show a parallel shift.

CHART 13
CHART 14

4.3 Comparison of the previous and current situation

When comparing the reference situation with the new situation, it appears that the families in Flanders will on average have to pay more for wastewater as well as drinking-water. The increase for wastewater is the highest, both nominally and expressed in percentages: +51% or +840 BEF on average. The drinking-water invoice increases with 3% (+130 BEF) on average, the increase in the total sum of the wastewater and drinking-water expenses amounts to 16% (+970 BEF).

It is clear that these absolute results are very sensitive to fluctuations in the water consumption volume. If water consumption were not to decrease with respect to 1996, the average increase in expenses per family would be considerably higher: 63% for wastewater (+1,051 BEF), 13% for drinking-water (+580 BEF) and 27% for the total amount (+1,631 BEF). The savings on drinking-water consumption have already been calculated (E<>0) into the above results, but in case of more significant behaviour effects, the difference between the current and former situation also decreases. One could say that, on average, domestic drinking-water consumption should decrease with more than 10% with respect to the 1996 level in order to avoid an increase in the drinking-water expenses. To avoid an increase in the total sum of the drinking-water and wastewater expenses, consumption should decrease with approximately 20%. These are very high values and will not be realised in the short term. Even the elasticities applied in the calculations of the current situation are ambitious when they are converted into water saving volume (-8%), particularly when compared to the

evolution of tap water consumption over the last few years[49]: This means the increase in expenses has certainly not been overestimated, in the short term it may even have been underestimated. Moreover, there is no doubt that a sharp decrease in water consumption also entails behaviour effects on the supply side. In this case, the drinking-water companies must distribute their fixed costs over a smaller consumption ratio, which results in new price increases. A similar effect for the tariffs of the wastewater charge is not excluded. *In other words, the conclusion remains that Flemish households will generally pay more for both wastewater and drinking-water after the reform.*

Below, the social effects in the former and current situation are compared more in detail. It is examined who are the winners and the losers in the end. Note that the tax exemption for certain categories of social incomes have still not been taken into account. Its influence on the conclusions will be examined later in this paper (see paragraph 4.4.)

4.3.1 Vertical distributive effects

Both the wastewater charge and the drinking-water invoice appear on average to be higher for all deciles in the current situation. Only for the highest deciles, are drinking-water expenses in 1998 on average lower than in 1996 if one reckons with a decrease in water consumption. Moreover, in terms of percentage, the increase is highest for the lowest deciles, for both wastewater and drinking-water. This is illustrated in tables 4.7 and 4.8. Table 4.7. shows the comparison of the vertical distributive impacts in the former and in the current situation if water consumption does not decrease (E=0). Table 4.8. contains identical information with decreasing water consumption (E<>0). *In both cases, the relative position of the poorer families clearly deteriorates.*

[49] See e.g. Janssens, I., M. Van Mol and D. D'hont, 1996; Vlaamse regionale Indicatoren (VRIND) (Flemish regional indicators), Planning and Statistics Department, 1996 and the annual reports of the various drinking-water companies.

Table 4.7. Comparison vertical distributive effects previous and current situation (E=0)

Decile	*tax 1996 (with Ks)*	*Tax 1998 (E=0)*	*% increase*	*water 1996*	*Water 1998 (E=0)*	*% increase*	*Total 1996*	*Total 1998 (E=0)*	*% increase*
Average	1661	2712	63%	4469	5049	13%	6131	7761	27%
1	848	1579	86%	2811	3677	31%	3660	5256	44%
2	953	1798	89%	3208	3843	20%	4161	5641	36%
3	1088	2055	89%	3377	4176	24%	4465	6231	40%
4	1415	2482	75%	4061	4773	18%	5476	7255	32%
5	1630	2716	67%	4475	4999	12%	6105	7715	26%
6	2112	3240	53%	5052	5762	14%	7164	9002	26%
7	1936	3143	62%	4850	5606	16%	6786	8750	29%
8	2067	3291	59%	5305	5600	6%	7372	8891	21%
9	2361	3534	50%	6123	6488	6%	8485	10022	18%
10	2201	3279	49%	5432	5568	2%	7633	8847	16%

Table 4.8. Comparison vertical distributive effects previous and current situation (E<>0)

Decile	*tax 1996 (with Ks)*	*Tax 1998 (E<>0)*	*% increase*	*water 1996*	*water 1998 (E<>0)*	*% increase*	*Total 1996*	*total 1998 (E<>0)*	*% increase*
average	1661	2501	51%	4469	4599	3%	6131	7101	16%
1	848	1423	68%	2811	3339	19%	3660	4762	30%
2	953	1641	72%	3208	3513	10%	4161	5154	24%
3	1088	1832	68%	3377	3716	10%	4465	5547	24%
4	1415	2266	60%	4061	4327	7%	5476	6593	20%
5	1630	2506	54%	4475	4557	2%	6105	7063	16%
6	2112	2963	40%	5052	5190	3%	7164	8153	14%
7	1936	2885	49%	4850	5073	5%	6786	7958	17%
8	2067	3074	49%	5305	5125	-3%	7372	8198	11%
9	2361	3324	41%	6123	5965	-3%	8485	9289	9%
10	2201	3100	41%	5432	5190	-4%	7633	8290	9%

This is also shown in chart 15. This chart traces the vertical distributive impacts of the total expenses in per mills of income. The gradient of the curve of the current situation (E<>0) is higher than the gradient of the previous situation (total with Ks). The lowest deciles are generally worse off.

In the chart two additional lines are traced. The upper line represents the situation without decrease in water consumption (E=0). Its interpretation corresponds with the estimate of the maximum or short-term distributive effects of the current regulation. The dotted line is the situation without Ks factors and if no measure for the drinking-water supply would have been taken. The course of this curve leads to the conclusion that *from a vertical equity point of view, the situation without Ks factors and without a measure for the drinking-water supply yields even better results than the current situation*.

CHART 15

4.3.2 Horizontal distributive effects

Tables 4.9. and 4.10 show the horizontal distributive impacts, expressed in BEF. Table 4.9. compares the horizontal distributive impacts in the former and current situations if water consumption does not decrease (E=0), while table 4.10 shows what happens when water consumption does decrease (E<>0). On average, all family categories appear to pay more *wastewater charge*. A certain corrective effect resulting from the abolition of the Ks factors can, however, be noted. Indeed, the increase is sharper for the smaller families. Compared to smaller families, larger families do slightly better.

The effect is very similar for *drinking-water expenses*. Moreover, here some categories, e.g. the households of four or more, pay less on average in the current situation than in the former one. This result is in line with the picture given in the above table 3.3, obtained using the data of the drinking-water companies. Families who pay less in the current regulation are often larger households.

When the expenses for wastewater and drinking-water are added up, only the largest families (7 and more persons) are nominally better off in the current situation. Comparing the increase percentages, again shows that *larger families on average do slightly better than small families*.

Table 4.9. Comparison horizontal distributive effects previous and current situation (E=0)

Number of family members	*Tax 1996 (with Ks)*	*Tax 1998 (E=0)*	*% increase*	*water 1996*	*water 1998 (E=0)*	*% increase*	*Total 1996*	*Total 1998 (E=0)*	*% increase*
Average	1661	2712	63%	4469	5049	13%	6131	7761	27%
1	881	1661	89%	2910	3869	33%	3791	5530	46%
2	1250	2336	87%	3960	4708	19%	5210	7044	35%
3	2058	3222	57%	5242	5881	12%	7301	9103	25%
4	2234	3429	54%	5451	5436	0%	7685	8866	15%
5	3181	4290	35%	6409	6588	3%	9590	10878	13%
6	4588	5716	25%	10087	9835	-2%	14675	15552	6%
7 and more	3541	4734	34%	7853	6093	-22%	11393	10827	-5%

Table 4.10. Comparison horizontal distributive effects previous and current situation (E<>0)

Number of family members	*Tax 1996 (with Ks)*	*Tax 1998 (E<>0)*	*% increase*	*water 1996*	*water 1998 (E<>0)*	*% increase*	*Total 1996*	*Total 1998 (E<>0)*	*% increase*
Average	1661	2501	51%	4469	4599	3%	6131	7101	16%
1	881	1458	66%	2910	3444	18%	3791	4902	29%
2	1250	2129	70%	3960	4262	8%	5210	6391	23%
3	2058	2966	44%	5242	5328	2%	7301	8294	14%
4	2234	3263	46%	5451	5073	-7%	7685	8336	8%
5	3181	4031	27%	6409	6069	-5%	9590	10100	5%
6	4588	5582	22%	10087	9503	-6%	14675	15085	3%
7 and more	3541	4593	30%	7853	5748	-27%	11393	10341	-9%

Chart 16 leads to the same conclusions. This chart shows the horizontal distributive impacts of the total expenses in per mills of the income. The distributive effects increase most of all for the smaller families when the previous situation (total with Ks) is compared with the current situation (E<>0).

CHART 16

The chart shows two additional lines. The upper line traces the situation without a decrease in water consumption (E=0) and can here also be interpreted as an estimation of the maximum distributive effects in the current situation. The dotted line is the situation without Ks factors and without the introduction of a free supply of drinking-water. The situation is different from that of the vertical distributive effects in that *from the horizontal equity point of view, the situation without Ks factors and without a drinking-water supply measure is not better than the current situation*.

4.3.3 Analysis of winners and losers

The above conclusions relate to the *average* family situation within a definite family category. However, these results do not show the fact that there are or can be both winners and losers within each family category. This should be taken into account when interpreting the results. This is illustrated below.

An analysis of winners and losers can be made on the basis of various *parameters*. In this case the above used parameters of income and family size are the obvious ones. Apart from these parameters, such an analysis could also start from the parameters of amount of water consumption per family and per person, of the increase in the level of the drinking-water price and of the district.

Below, the *number* of winners and losers is examined. A winner is defined as a family that pays less in the current situation than in the previous one, while a loser is a family that pays

more. This means that the *amount* of the decrease or increase in expenses is not taken into account.

The analysis only takes the drinking-water invoice into account, and the total wastewater and drinking-water expenses, since, for the *wastewater charge* the situation is simple. Abolishing the Ks factors and introducing the higher tax tariff, entails that all families will have to pay more in the current situation. This also explains why the number of winners for total expenses is always lower than for drinking-water expenses, and vice-versa regarding the number of losers. This result is further differentiated when adjustments are made reckoning with the influence of the tax exemption for certain categories of social incomes.

Finally, it is worth mentioning that the present paper provides a description and *no explanation* of the estimated number of winners and losers in the current situation. The current situation in the analysis below does take a decrease in water consumption (E<>0) into account.

With respect to income

Table 4.11. shows an estimate of the number of families in Flanders that will profit from the current regulation and of the families that will have to pay more per income decile. To facilitate the interpretation, the numbers are given as percentages of the total number of families in Flanders.

Table 4.11. Winners and losers with respect to income

	Drinking- water	*Expenses*		*Total Expenses*			*drinking- water*	*expenses*		*total expenses*		
dec	*Loser*	*winner*	*Total*	*Loser*	*winner*	*Total*	*loser*	*winner*	*total*	*loser*	*winner*	*total*
1	87%	13%	100%	91%	9%	100%	13%	4%	10%	10.2%	8.3%	10%
2	72%	28%	100%	88%	12%	100%	11%	8%	10%	9.8%	11.3%	10%
3	80%	20%	100%	92%	8%	100%	12%	6%	10%	10.3%	7.4%	10%
4	78%	22%	100%	94%	6%	100%	12%	7%	10%	10.5%	5.8%	10%
5	64%	36%	100%	92%	8%	100%	10%	11%	10%	10.3%	7.4%	10%
6	61%	39%	100%	91%	9%	100%	9%	12%	10%	10.2%	8.4%	10%
7	69%	31%	100%	92%	8%	100%	10%	9%	10%	10.3%	7.4%	10%
8	60%	40%	100%	86%	14%	100%	9%	12%	10%	9.6%	13.6%	10%
9	48%	52%	100%	86%	14%	100%	7%	16%	10%	9.5%	13.9%	10%
10	47%	53%	100%	83%	17%	100%	7%	16%	10%	9.3%	16.4%	10%
total	67%	33%	100%	90%	10%	100%	100%	100%	100%	100%	100%	100%

The percentages of the first two columns of table 4.9. were added horizontally. The first column shows the drinking-water expenses. 67% of the total number of Flemish families are worse off in the current regulation. The remaining 33% is better off. The percentage of losers is higher in the lower deciles and lower in the higher deciles. It is clear that for the percentage of winners this is just the opposite. As has been pointed out above, the number of losers is always higher if the total expenses are considered rather than the drinking-water

expenses. Of the entire Flemish population, 90% of the families is worse off. Except for the highest deciles, the number of losers per decile, in terms of percentages, is very close to the overall percentage of 90%.

The percentages in the third and fourth columns were added vertically. The highest number of losers as to drinking-water is found in the first decile (13%). Most winners can be found in the highest decile (16%). For the total expenses, winners and losers are rather evenly distributed over the different deciles. However, the highest deciles have a proportionally high ratio of winners.

With respect to family size

A similar table can be drawn up for families subdivided with respect to size (see table 4.12). Considering each family category, the category of smaller families contains relatively fewer winners than the categories of larger families. However, in Flanders the larger families represent a minor group (8% of the families consist of 5 or more persons), which, for the whole of the Flemish population means that the winners are generally smaller and medium size families.

Table 4.12. Winners and losers with respect to family size

Number	*Drinking- expenses water*			*Total Expenses*			*drinking- expenses water*			*Total Expenses*		
Members	*Loser*	*winner*	*total*	*loser*	*winner*	*total*	*loser*	*winner*	*total*	*Loser*	*winner*	*Total*
1	88%	12%	100%	92%	8%	100%	31.1%	8.5%	23.6%	24.2%	18.3%	23.6%
2	76%	24%	100%	94%	6%	100%	36.4%	22.8%	31.8%	33.5%	17.6%	31.8%
3	59%	41%	100%	94%	6%	100%	17.5%	24.6%	19.9%	20.8%	11.9%	19.9%
4	38%	62%	100%	82%	18%	100%	9.8%	31.4%	17.0%	15.5%	29.7%	17.0%
5	48%	52%	100%	76%	24%	100%	4.0%	8.7%	5.6%	4.7%	12.8%	5.6%
6	52%	48%	100%	70%	30%	100%	1.0%	1.8%	1.3%	1.0%	3.8%	1.3%
7 (+)	18%	82%	100%	30%	70%	100%	0.2%	2.2%	0.9%	0.3%	5.9%	0.9%
Total	67%	33%	100%	90%	10%	100%	100%	100%	100%	100%	100%	100%

With respect to water consumption

Table 4.13 which subdivides the households with respect to the amount of water consumption per family, and particularly table 4.14, which gives the subdivision with respect to the consumption per person, confirm that the winners in the current regulation are mainly families with a low water consumption. Few winners can be found in the category of large water consumers (per family or per person). Considering the entire Flemish population, more than 90% of the winners on the total expenses level is found in the category of households with an annual water consumption of 30 m3 or less per person. Unfortunately, only 35% of all Flemish families belong to that group (see table 4.12).

Table 4.13. Winners and losers with respect to consumption per family

Q pf.	*Drinking- water*	*Expenses*		*total Expenses*			*Drinking expenses water*			*Total expenses*		
m3	*Loser*	*winner*	*Total*	*loser*	*winner*	*total*	*Loser*	*winner*	*total*	*Loser*	*winner*	*total*
0-50	55%	45%	100%	76%	24%	100%	19.1%	31.6%	23.3%	19.7%	54.5%	23.3%
51-100	69%	31%	100%	95%	5%	100%	35.2%	31.9%	34.1%	36.0%	17.0%	34.1%
101-150	65%	35%	100%	94%	6%	100%	23.7%	25.7%	24.3%	25.4%	14.9%	24.3%
151-200	73%	27%	100%	92%	8%	100%	12.0%	8.8%	10.9%	11.2%	8.5%	10.9%
201-300	89%	11%	100%	91%	9%	100%	8.0%	2.1%	6.0%	6.1%	5.1%	6.0%
301-500	100%	0%	100%	100%	0%	100%	2.0%	0.0%	1.4%	1.5%	0.0%	1.4%
Total	67%	33%	100%	90%	10%	100%	100%	100%	100%	100%	100%	100%

Table 4.14. Winners and losers with respect to consumption per person

Q pp.	*Drinking- water*	*expenses*		*total Expenses*			*Drinking- water*	*expenses*		*Total expenses*		
m3	*Loser*	*winner*	*total*	*loser*	*winner*	*total*	*Loser*	*Winner*	*total*	*Loser*	*winner*	*total*
0-15	13%	87%	100%	45%	54.6%	100%	1.6%	20.1%	7.8%	3.9%	41.1%	7.8%
16-30	38%	62%	100%	81%	18.7%	100%	15.7%	51.8%	27.7%	25.1%	50.4%	27.7%
31-45	79%	21%	100%	99%	0.8%	100%	36.3%	19.0%	30.5%	33.7%	2.5%	30.5%
46-60	91%	9%	100%	97%	3.1%	100%	23.9%	4.6%	17.4%	18.8%	5.2%	17.4%
60 +	91%	9%	100%	99%	0.5%	100%	22.6%	4.5%	16.6%	18.4%	0.8%	16.6%
Total	67%	33%	100%	90%	10%	100%	100%	100%	100%	100%	100%	100%

With respect to the importance of the price increase

In table 4.15, winners and losers are subdivided according to the increase percentage of the marginal drinking-water price. The category of families confronted with a considerable price increase (> 70%) proportionally appear to include more winners. Below this value, however, no univocal relation can be found between the importance of the price increase and the number of winners or losers.

Table 4.15. Winners and losers with respect to amount of price increase

mp.	*Drinking- water*	*expenses*		*Total expenses*			*Drinking- water*	*expenses*		*total expenses*		
incr.%	*Loser*	*winner*	*total*	*Loser*	*winner*	*total*	*Loser*	*winner*	*total*	*loser*	*winner*	*total*
0-40	57%	43%	100%	90%	10%	100%	28.3%	42.9%	33.2%	33.2%	33.0%	33.2%
41-50	69%	31%	100%	95%	5%	100%	17.1%	15.3%	16.5%	17.5%	7.8%	16.5%
51-60	72%	28%	100%	97%	3%	100%	17.8%	13.5%	16.4%	17.7%	5.0%	16.4%
61-70	82%	18%	100%	93%	7%	100%	33.1%	14.3%	26.8%	27.7%	19.0%	26.8%
71-80	26%	74%	100%	56%	44%	100%	0.7%	4.2%	1.9%	1.2%	8.1%	1.9%
81-100	40%	60%	100%	43%	57%	100%	1.2%	3.7%	2.1%	1.0%	11.3%	2.1%
100 +	36%	64%	100%	49%	51%	100%	1.7%	6.1%	3.2%	1.7%	15.8%	3.2%
Total	67%	33%	100%	90%	10%	100%	100%	100%	100%	100%	100%	100%

With respect to district

Finally, it appears that the number of winners and losers differs considerably according to the district. This is related to the varying drinking-water prices throughout Flanders. A

quantitative picture of this is not given because, as has already been pointed out, the family budget sample survey did not explicitly take the actual regional distribution of the households in Flanders into account. Consequently, a more thorough analysis is required for a reliable regional analysis.

4.4 Influence of the tax exemption on the results

Until now, the analysis has taken the "current situation" to mean the free supply of 15 m^3 of drinking-water per person per year for domestic subscribers. In other words, it did not yet consider the fact that taxpayers who enjoy the minimum state pension, the subsistence money allocated by the OCMW (social welfare organisation) or the allowance that replaces the income for the disabled, will from now on, be exempted from paying wastewater charge. The reason for this was that the family budget survey does not provide sufficiently detailed information on the origins of the family incomes. A second reason was that this is a *specific* measure, i.e. a measure applicable to well-defined population groups that can be combined with any general measure. That is why the two *general measures* were first compared with one another. The question now rises if the tax exemption indeed has an influence on the results. Below, the influence of the tax exemption on the results for the wastewater charge is examined first. Later, the influence on the drinking-water invoice and on the total wastewater and drinking-water expenses is discussed.

Influence on the wastewater charge

The assessment of the influence of the tax exemption is inevitably a rather rough one. According to the government, approximately 150,000 families in Flanders are eligible for the exemption (see paragraph 2.1.)[50]. Assuming that all these families belong to the lowest income decile, a new average tax amount that takes the exemption into account can then be calculated for the first decile, using the average tax amount that was calculated for the remaining families from the first income decile. In this way, the influence of the exemption on the average nominal and on the vertical distributive effects can be analysed.

The results of this calculation are shown in table 4.16. It shows the nominal and relative vertical distributive effects in the previous situation (Ks factors), the situation without Ks factors, and the real situation without Ks factors and with an exemption for certain social incomes. The measure relating to the drinking-water supply was not taken into account, and this resulted in a constant water consumption volume (E=0).

[50] On the basis of the available statistic material (1/1/96), we obtain approximately 108,000 families (heads of families and singles). Moreover, if all persons living together, are included - part of them will not be eligible for the exemption in any case - , the number of families amounts to a maximum of 130,000. The estimate made by the government is probably an overestimated figure of the number of families eligible for the wastewater tax exemption. The experience of the 1997 wastewater charge shows that this is, indeed, the case.

Table 4.16 Influence of the tax exemption on the wastewater charge

Decile	*Tax with Ks (tariff 980)*	*tax without Ks (tariff 1005)*	*tax with exemption (tariff 1005)*	*tax with Ks (tariff 980) /income (0/00)*	*tax without Ks (tariff 1005) /income (0/00)*	*tax with exemption (tariff 1005) /income (0/00)*
Average	1661	2712	2608			
1	848	1579	537	1.82	3.45	1.17
2	953	1798	1798	1.49	2.79	2.79
3	1088	2055	2055	1.37	2.58	2.58
4	1415	2482	2482	1.53	2.69	2.69
5	1630	2716	2716	1.54	2.57	2.57
6	2112	3240	3240	1.76	2.70	2.70
7	1936	3143	3143	1.43	2.32	2.32
8	2067	3291	3291	1.34	2.13	2.13
9	2361	3534	3534	1.31	1.96	1.96
10	2201	3279	3279	0.87	1.32	1.32

In nominal terms, the average tax amount per family decreases with approximately 100 BEF with respect to the situation without Ks factors due to the exemption. However, for the first income decile this is different. In this decile, the average tax amount decreases from 1,579 BEF to 537 BEF. Moreover, the lowest income group is nominally better off, notwithstanding the tariff increase, even in comparison with the previous regulation. The average tax amount for the first decile was then 848 BEF.

The relative vertical distributive effects are also the least important for the lowest decile. This is also shown in chart 17. This chart traces the influence of the tax exemption on the relative vertical distributive effects. Generally speaking, the tax exemption for certain social incomes clearly has a favourable social effect[51]. The winners are the families that are exempt from paying tax. For the families that cannot enjoy exemption, the above calculated distributive effects obviously remain applicable.

CHART 17

The numeric influence on the results on the horizontal level cannot be determined because the information available is not sufficiently detailed.

Influence on the drinking-water invoice

The exemption granted to the above categories of social income has an influence on the tax amount they have to pay, but not on their drinking-water expenses. In other words, the

[51] When calculating with a lower number of families that is eligible for tax exemption, the impact of the exemption is obviously smaller. The conclusions however, remain the same. 125,000 exemptions e.g. yield an average tax amount for the first decile of 710 BEF or 1.55 per mill of the income. This is still less than 848 BEF and the 1.82 per mill of the previous regulation.

distributive effects of the drinking-water invoice remain the same as was estimated above (see paragraph 4.2.).

Influence on the total expenses

As has been pointed out above, in nominal terms, the average tax amount per family in the current situation decreases with approximately 100 BEF due to the exemption. The average drinking-water expenses remain unchanged, which results in a more limited increase in the average total expenses: from 970 BEF more in the current regulation without tax exemption, to approximately 875 BEF more with exemption. The average total expenses for the first income decile increase from 3,660 BEF to 3,821 BEF. This increase is lower than when no tax exemption is applied (on average 4,762 BEF for the first income decile).

Table 4.15. Influence of the tax exemption on the total expenses

decile	*total 1996*	*total 1998 (E<>0)*	*total 1998 (E<>0), incl. Exemption*	*total 1996 /income (0/00)*	*Total 1998 (E<>0) /income (0/00)*	*total 1998 (E<>0), incl. Exemption /income (0/00)*
average	6.131	7.101	7007			
1	3660	4762	3821	8.03	10.54	8.46
2	4161	5154	5154	6.48	8.02	8.02
3	4465	5547	5547	5.60	6.96	6.96
4	5476	6593	6593	5.93	7.13	7.13
5	6105	7063	7063	5.79	6.71	6.71
6	7164	8153	8153	5.97	6.79	6.79
7	6786	7958	7958	5.01	5.87	5.87
8	7372	8198	8198	4.78	5.31	5.31
9	8485	9289	9289	4.71	5.15	5.15
10	7633	8290	8290	3.08	3.35	3.35

Chart 18 shows the influence of the tax exemption on the vertical distributive effects of the total expenses. As a consequence of the exemption, the families of the first decile are *on average* clearly better off, but this is insufficient to compensate for the regressive impact on the incomes distribution. All deciles pay on average more than before and the regressivity continues to exist. *Only the families from the lowest income category are (on average) relatively less worse off*. As a consequence, the lowest income category will have more winners than indicated by the above estimate. It is impossible to give precise figures. The available information is insufficiently detailed. Likewise, for the horizontal distributive effects, the available data do not allow tracing the influence on the results on the horizontal level.

CHART 18

5. CONCLUSIONS

5.1 Objective, method an hypotheses

By the decree of 20 December 1996, stipulating the accompanying clauses for the 1997 budget, the former social correction of the wastewater charge (the so-called Ks factor) was abolished. Instead, a tax exemption for certain underprivileged population groups was introduced. A free supply of 15 m3 of drinking-water per person was expressly presented to the Flemish Parliament and the Flemish population as a measure to compensate for the abolishment of the Ks factors in the wastewater charge.

Therefore, two different matters were analysed in this paper. First of all it was examined to what extent the new social correction for the *wastewater charge* offers a better social protection than the previous Ks factor. Second, the distributive effects of the entire new system were analysed, i.e., including the free supply of 15 m3 of drinking-water per person.

The basic data for this type of analysis had to make it possible at least to establish a relation between the water consumption of a family, family income and the number of family members. Therefore, it was based on the most recent family budget survey by the National Institute for Statistics. This sample survey was taken in the period 1995-1996. A large number of really existing families out of a representative sample of the Flemish population were surveyed. These data were combined with the information on the evolution of the drinking-water prices in Flanders. Indeed, the compulsory free supply of 15m3 of drinking-water per person has led to important changes in the tariff structure and is also the cause of the considerable increases in the marginal prices of drinking-water.

Due to some inherent limitations of the available figures the estimated distributive effects can deviate from the real situation. However, this is almost always the case in studies like the present one because ideal information seldom or never exists. The following limitations can be mentioned:

- The water consumption of the families from the family budget survey was not known but had to be calculated on the basis of their tap water expenses;
- The family budget survey contained families with a zero consumption, families with combined expenses, and the like, which meant that not all the data were useful for the analysis. This diminished the size and the representativity of the sample survey.
- The drinking-water prices used are based on the information obtained from the drinking-water companies and on information from the Ministry of Economic Affairs, but are not necessarily the real tariffs. Indeed, upon termination of the collection of the figures for this paper, a number of price studies still had to be submitted to the Ministry of Economic Affairs.

- The increase of the drinking-water price is mainly but not exclusively due to the free supply of 15 m3 of drinking-water per person. Other elements that have had an influence are: the recently introduced groundwater tax and possible increases in the traditional components of price (e.g. labour costs, capital charges, running costs, …). The increase resulting from these factors could not be determined separately;
- During the sample survey, the NIS did not take into account the regional distribution of the respondents over Flanders as a whole, and yet, the distributive effects may differ considerably from district to district as a consequence of the various drinking-water prices.
- The evolution of the drinking-water consumption is important. This evolution is one of the factors that determine the size of the distributive effects, but it is not sufficiently known.

For each of these limitations and imperfections in the figures, working hypotheses had to be adopted, alternatively various scenarios were examined. Some of these hypotheses can lead to an overestimation of the distributive effects, others can result in an underestimation. However, considering all hypotheses used, there are no indications that the conclusions have to be adapted. It is also worth mentioning that the results obtained, are related to that part of the Flemish population that uses tap water, either totally or partly, as its drinking water. They are not applicable to families that use only their own well water supply.

5.2 Results of the analysis

The differences between the distributive effects in the current and previous situation were shown in a number of intermediary steps. These steps allow a separate evaluation of the results for the new calculation formula of the wastewater charge, the new tariff structure for the drinking-water supply, and the total expenses (drinking-water + wastewater).

Wastewater charge

Relating to wastewater charge, two measures were implemented. First, the so-called Ks factors in the wastewater charge were abolished. Second, a tax exemption was introduced for certain categories of social income.
Our earlier findings in SERV (1993) are confirmed by the new calculations. The Ks factors had a certain levelling impact on the regressivity of the wastewater charge without social correction, but yielded bad results with respect to the criterion of the horizontal equity. With respect to the vertical distributive effects, however, the results seem to be better than was first estimated on the basis of the data from the 1987-1998 family budget survey. This does not change the fact that the SERV maintains its evaluation as formulated in its 1993 recommendation. This recommendation asked for the abolition of the Ks factors and their replacement with a new, more efficient regulation. Indeed, in the Ks factors, neither purchasing power nor the number of dependants were taken into account. Moreover, it was

an overall measure applicable to all families. All families had to pay less than in a situation without social correction. The Ks factors did not focus sufficiently on the most affected population groups.
The abolition of the Ks factors in the wastewater charge, *first of all*, leads to a deterioration of the relative position of the poorer families. In relative terms, the larger families are slightly better off, but the benefit is limited. In nominal terms, all families are worse off. Everybody pays more than before.
The exemption for certain categories of social incomes, which the 1993 SERV recommendation already asked for, however, does improve the score of the new tax regulation on the vertical level. In nominal terms, the average tax amount decreases for each family of the first income decile. The relative vertical distributive effects are also lowest for the lowest decile in the current situation. *In other words, the tax exemption for certain social incomes has an obvious positive effect on the vertical level*. Its influence with respect to the results on the horizontal level could not be evaluated because the available information was insufficiently detailed.

The conclusion is that the exemption yields better results with respect to the relative vertical distributive effects than the Ks factors. The tax exemption is selectively focused on the most needy population groups. However, for the families that cannot enjoy an exemption, the nominal purchasing power effects increase considerably. As a result, the expenses continue to weigh rather heavily on the families in the lowest income groups that are not entitled to an exemption. With respect to the horizontal distributive effects, the larger families seem to be less worse off than the smaller families.

Drinking-water supply

The drinking-water expenses appear to increase with increasing income and family size. In the former 1996 situation, however, these expenses were regressively distributed over the various deciles. Particularly for the two lowest deciles, the expenses in proportion to the income were important. Expressed in function of the income, the purchasing power effects also increased in larger families.
The new prices and price structure in the drinking-water supply, partly but certainly not exclusively due to the introduction of the free supply of 15 m3 of drinking-water per person, have resulted in an increase in the average family expenses for drinking-water. If the water consumption volume remains constant compared to 1996 - i.e. the short-term effect - the average increase amounts to 13%. If a decrease in water consumption due to the increased tariffs is taken into account, the average family expenses increase with 3%.
In the current situation, larger families on average pay less for drinking-water than before, while smaller families pay more. In relative terms, larger families also benefit more from the new regulation compared to smaller families. On the horizontal level, the current situation yields positive distributive results. On the vertical level, however, the increase in the drinking-water expenses is on average the highest for the poorer families. Only for the

highest deciles are the drinking-water expenses in 1998 on average lower than in 1996 (reckoning with a decrease in water consumption). O*n average, the relative position of the poorer families is deteriorating.* The regressivity of the drinking-water expenses, which already existed in the previous situation, continues to increase. This conclusion is valid both in case of a constant and decreased water consumption.

When the wastewater charge situation is compared with that of the drinking-water supply, the picture becomes clear. The purchasing power effects for the drinking-water supply are not only higher - the drinking-water expenses on average amount to the double of the wastewater expenses - but also the regressivity of these expenses is stronger. Consequently, one could ask whether the need for an efficient social protection of the most affected population groups is not more acute here than on the level of wastewater charge.

Total expenses

The comparison of the previous and current situation, taking the total wastewater and drinking-water expenses into account, showed that the Flemish households will on average have to pay more in the current situation. The total sum of wastewater and drinking-water expenses per family on average increases with approximately 1,600 BEF if water consumption does not decrease (short-term) and with 1,000 BEF if a water consumption decrease is taken into account.
Moreover, in both cases, the relative position of the poorer families deteriorates. On average, it is mainly the poorer families who are confronted with the highest increase in expenses. Therefore, poorer families are also relatively worse off compared to richer families. Their purchasing power decreases more sharply. Consequently, the regressivity of the total expenses (wastewater + drinking-water) is higher in the current situation than in the previous one. Even the systems without Ks factors and without a free supply of drinking-water, yield better results on the vertical level than the current regulation.
On the horizontal level, however, a certain corrective effect of the current regulation becomes apparent. Compared to smaller families, larger families do slightly better. Moreover, the largest families on average appear to pay less in the current situation.

Finally, the conclusion is that the overall current situation on average does not yield better results than the previous regulation. The nominal purchasing power effects and the regressivity of the expenses increase. The result for the horizontal distributive impacts is more positive, but this does not influence the negative evaluation of the current regulation. For the SERV, the prevailing criterion of the two is vertical equity[52].

[52] SERV, 1993, p. 10.

The tax exemption does not influence this conclusion substantially. All deciles on average pay more than before and the regressivity continues to exist. *Only families from the lowest income category (on average) are relatively less worse off*. The wastewater charge exemption cannot sufficiently compensate for the regressivity of the drinking-water expenses. The influence of the tax exemption on the horizontal level could not be analysed on the basis of the available data.

5.3 Explanation of the results

Although the analysis confirms that water consumption increases with family income and that the per capita consumption decreases with increasing family size, the hypothesis that the water invoice in the current situation will decrease for the households with a lower family income *as a result of this*, is not sustained. The hypothesis that the current situation is favourable for large families, however, is confirmed. This can be explained as follows:

- It was clear that the wastewater expenses for an average family in Flanders would increase. This results from the increase in the tax rate for waste water, but more in particular from the abolition of the Ks factors. Only for a limited number of families that can enjoy tax exemption, do the wastewater expenses decrease. The drinking-water expenses remain the same at best. If the current regulation had only consisted of a tariff structure change, this would merely have implied another way of calculating the apportionment of the costs, and drinking-water expenses would on average have remained the same as before. The current regulation for the drinking-water supply, however, does entail an increase in expenses. More in particular, the free supply causes additional administration costs for the distribution companies. These are calculated into the prices. Moreover, other factors were also involved in carrying out the price increases (e.g. the recently introduced groundwater tax).

- Because the Ks factors increased in function of water consumption, large families had to pay relatively high taxes before the reform. So the position of large families improved when the Ks factors were abolished. Also the free supply of 15m3 of drinking-water per person is particularly favourable for the larger families. As a rule, economies of scale entail a decrease in the average consumption per person with increasing family size. This yields a double effect. First, the free 15 m3 of drinking-water per person constitutes an additional part that is free of charge in the extra water consumption, per extra family member. Second, this implies that the remaining quantity of drinking-water that is charged at the (considerably) increased marginal tariff is relatively smaller.

- The two above-mentioned elements also explain the bad score of the current situation on the vertical level. In the previous situation the expenses were already distributed regressively. To a certain extent, the regressivity of the wastewater charge without social correction was limited by the Ks factors; but they were insufficient to have any

effect on the regressivity of the total expenses. Indeed, the family's drinking-water expenses used to be strongly regressive and were much higher than their wastewater expenses. As has been pointed out above, the expenses of an average family increase in the current regulation. A similar nominal increase in the expenses weighs more heavily in the income and the spendings of the lower deciles, which causes an increased regressivity. Moreover, the increase in the drinking-water expenses is not evenly distributed over the various income deciles. In absolute terms as well as in percentages, it is smaller for the highest deciles than for the lowest. This is linked to the fact that rich families on average are also large families, and results in a further increase of the regressivity of the drinking-water expenses, and of the total expenses.

- Finally it is worth mentioning that this evaluation of the current situation is based on average figures and that there will always be both winners and losers. Not all the families of the lowest decile, for instance, are worse off if their total expenses are considered: 9% will pay less than before. 38% of the largest families will pay more. In all, it is estimated that approximately 10% of the Flemish families will have to pay less than before while 90% will have to pay more. Still, these figures do not take the tax exemption into account. Consequently, the real number of losers will be slightly lower while the real number of winners will be higher. With the available data, however, the tax exemption effect cannot be calculated accurately.

5.4 Towards an overall evaluation of the current situation

In the present paper, the wastewater and drinking-water expenses in the current 1998 situation were evaluated with respect to their social consequences for the Flemish households in comparison to the former situation which existed in 1996. The results demonstrate that a thorough evaluation of the introduced measures is indispensable. In an overall evaluation of the current situation, however, other considerations should also be taken into account.

When evaluating a social correction within environmental policy, not only its social effectiveness, for instance, but also its compatibility with the principles and objectives of environmental policy must be considered. Here for instance, the allocative efficiency, as illustrated by the "the polluter pays" principle, is important[53]. Concerning the *allocative efficiency* of the current regulation for the wastewater charge, the minister of the environment stated in the Flemish Parliament, and on other occasions, that Parliament had opted for a stricter introduction of this principle, possibly with a minimum social correction. The minister stated that the new regulation would lead to an increased revenue in the wastewater charge and that the costs of the new social correction would mainly be borne by the water supply side. According to the minister, the water treatment invoice is then actually

[53] See SERV, 1993.

paid by the polluter[54]. The minister also underlined that the discussions on the wastewater charges and the contributions of the families and the companies, have not yet been concluded: "An additional study by the VMM has been requested. The required data must be available for the preparations of the 1998 budget, and the discussions will then be resumed"[55].

An overall evaluation of the current tariff structure for the drinking-water supply cannot be limited to an analysis of the social effects on the families either:

- The current regulation also wants to stimulate a more *rational water use*[56], and certainly led to a (sometimes even very sharp) increase in the marginal drinking-water price in the whole of Flanders. Moreover, this paper shows that the average price will increase for a large number of families and that water consumption is indeed price sensitive. So, it is clear that these price effects, particularly on a long-term basis, will result in a change in the families' behaviour. These substitution effects can be either positive or negative (e.g. lower tap water consumption, higher groundwater consumption, …). In addition, the free supply of 15 m3 of drinking-water per person could constitute a major obstacle to a more economical use of tap water, since for this quantity of water no price is charged. These aspects should also be considered in an overall evaluation.
- Moreover, the current regulation for the drinking-water supply does not only have consequences for the families. C*ompanies* are confronted with the effects of the new measure as well. Indeed, water supply companies often compensate the costs due to the free supply of 15 m3 of drinking-water per person by introducing considerable price increases per m3 of drinking-water. Although companies do not enjoy a free supply of a certain quantity of water, they are often charged the increased tariffs all the same. For a considerable number of companies this results in higher drinking-water expenses.
- The *feasibility* of the current regulation is evaluated elsewhere. The minister announced that he intends to discuss possible execution problems more in detail with the water supply companies (e.g. the data on the number of family members per subscriber, the definition of domestic consumption, the differences between the invoice periods and a calendar year, subscribers who move elsewhere, …)[57].
- The 1997-2001 environmental policy plan mentions an adaptation of the tariff structures and tariffs for drinking-water with a view to a *renewed tariff policy*. This objective should also be part of an overall evaluation.

[54] Vl.P., 1996-1997, 428/18, p. 9.
[55] See Vl.P., 1996-1997, 428/18, p. 10. This deadline however has not been respected.
[56] Vl.P., 1996-1997, 428/18, p. 4.
[57] Vl.P., 1996-1997, 428/18, p. 9.