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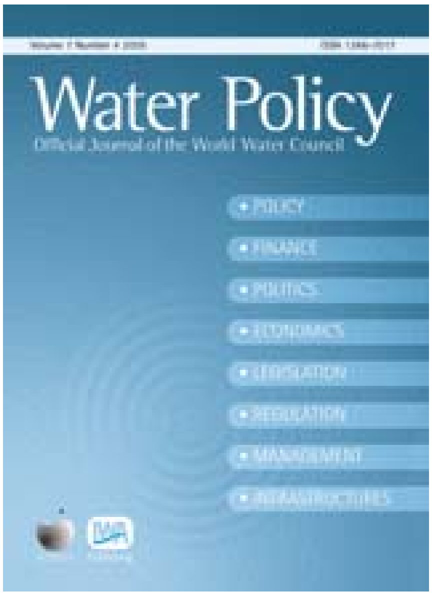

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Water Policy 15 (2013) 1064–1077

The life and death of the Dutch groundwater tax

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Abstract

We examine the Dutch national groundwater tax (GWT) – a 'win–win, green' tax that promised to reduce distortions by simultaneously reducing the income tax burden and improving environmental outcomes. We find no evidence of these impacts. Instead, we see that the GWT increased distortions by taxing a narrow base (a few drinking-water companies reliant on raw groundwater) and interfering with groundwater management programmes funded by an existing provincial groundwater fee. The Dutch government revoked the GWT for being fiscally inefficient and environmentally unhelpful on 31 December 2011, but this story provides some useful lessons.

Keywords: Fiscal policy; Green tax; Groundwater; Pigouvian tax; Regulation

What does a 'win–win, green' tax look like?

Double-dividend policies supposedly reduce harmful activities while delivering beneficial outcomes (Fullerton & Metcalf, 1998; EEA, 2011). Many 'win–win, green' taxes implemented in the 1990s promised to deliver such dividends by taxing activities that harmed the environment and using tax revenues to deliver social goods. In this paper, we analyse a Dutch groundwater tax (GWT) implemented in 1995 whose revenue would be used to reduce income taxes (Trouw, 1993; Vermeend, 2011) and whose impact would improve groundwater conditions, that is:

> '*This [GWT] is based on the idea that clean, fresh groundwater is a scarce good and that striving for sustainable development – as government and parliament endorsed – obliges the current generation to be economical of it so future generations can provide for their needs.* Ministers of Finance and Housing, Spatial Planning & Environment' (Eerste Kamer der Staten Generaal, 1994, p. 2).

Our analysis considers a fundamental tension within the promise of win–win (a tax on a good with elastic demand will change behaviour instead of raising revenue (and vice versa)), as well as the

doi: 10.2166/wp.2013.112

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interaction of the GWT with existing provincial groundwater fees (PGFs) already directed at groundwater management.

Previewing our results, it turns out that the GWT's environmental impact was limited by its one-size-fits-all disincentive to extract groundwater in a country that sometimes has too much groundwater, existing programmes funded by the PGF, and a failure to connect the GWT to groundwater status. Its economic effectiveness as a revenue-raising device was enhanced by the exemption of small groundwater users, but these exemptions narrowed the revenue base to the point where 10 drinking-water companies (DWCs) paid nearly 90 per cent of the tax, but 900 others paid the rest. That narrow, skewed base made it possible to claim that the GWT was inefficient at the same time as it created a special interest group that would benefit from the GWT's demise.

The Dutch GWT experience offers several useful lessons. First, clarify whether a tax is meant to raise revenue or change behaviour. Second, set a baseline of environmental conditions and then monitor those conditions when a policy or tax is meant to change the behaviour affecting those conditions. Third, implementation of any new policy must consider its interaction with existing policies. Fourth, consider the relative impacts of a tax on the members of its revenue base; a base of 1,000 payers may be better than a base of 100 payers, but not if most of the tax falls on 10 members of the 1,000-payer base. In summary, win–win taxes are about as easy to find as free lunches.

The rest of the paper will describe how we came to these conclusions. It follows a rather linear path, beginning with a description of Dutch water flows, management institutions and the GWT design, before moving to a discussion of the tension between the inversely related impacts of taxes and description of how the GWT impacted environmental and economic outcomes before it was cancelled. We conclude with some remarks about how the Dutch experience applies elsewhere.

Water, management and taxes in the Netherlands

The Netherlands is known for its dykes, windmills and tulips, but none of these would exist without the institutions that the Dutch created to defend themselves – and their land – from flooding. These institutions evolved over hundreds of years, and their interlocking nature affected the design, implementation and impact of the GWT.

Water in the Netherlands

One third of the Netherlands lies below sea level – mostly in the north and west of the country – and groundwater levels there need to be kept low to prevent flooding. Groundwater levels in the higher-elevation eastern and southern regions of the country are further below the surface; they need to be maintained or raised to protect the environment and minimize costs to water users. The cross-section in Figure 1 shows fresh and brackish aquifer layers relative to Normaal Amsterdams Peil (NAP), the zero value of which is set to the height of summer floods, that is, above mean sea level. Water managers use the NAP as a reference point for preventing floods or maintaining water storage. The two halves of the Netherlands – flood-vulnerable in the west, overextraction-vulnerable in the east – can be seen in the left frame of Figure 2, which also shows dyke and dune defences against flooding.

The Netherlands receives about 90 per cent of its freshwater from rivers flowing from Germany and Belgium; annual precipitation is 900 mm and annual average water availability is 5,400 m^3 per capita

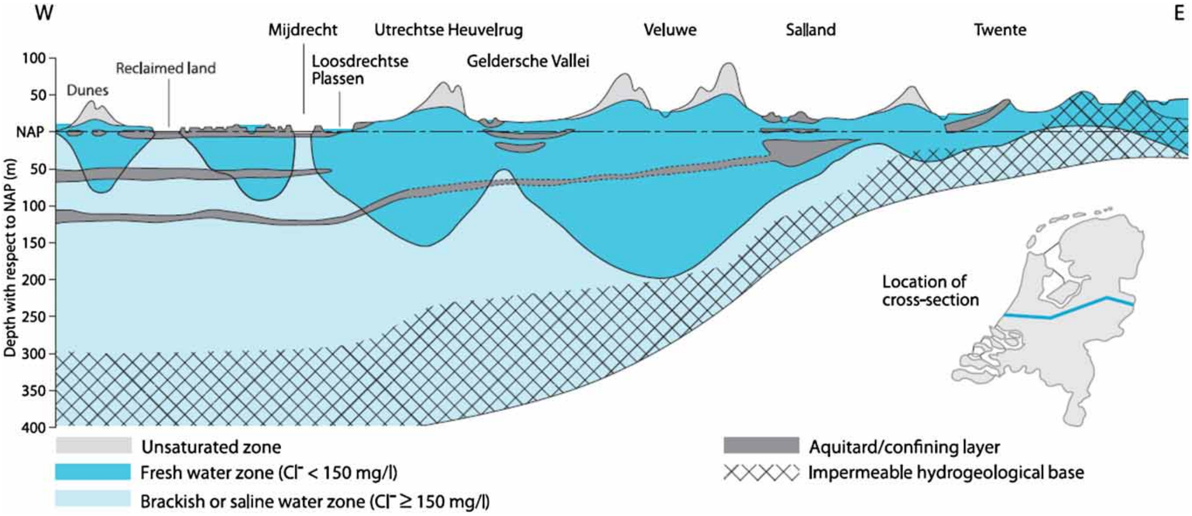

Fig. 1. Dutch aquifers occur in layers, above and below NAP. *Source:* De Vries (2007).

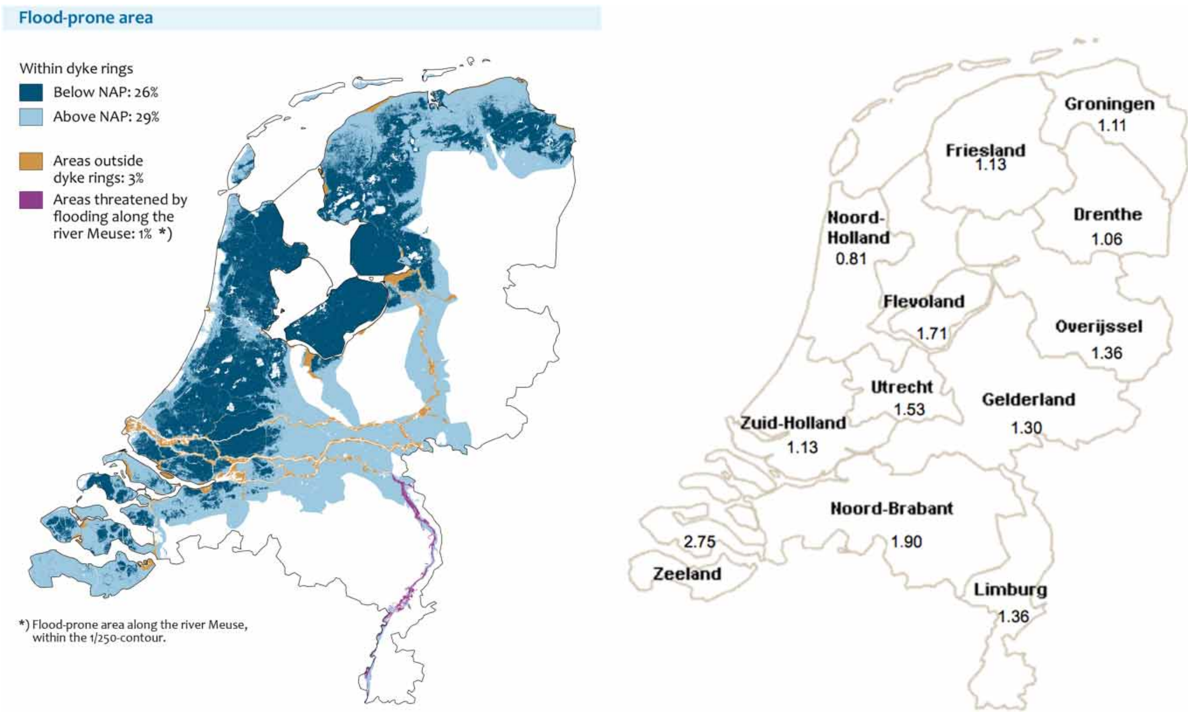

Fig. 2. Most of the western Netherlands is at risk of flood (left frame). PGFs vary according to local water conditions (right frame); amounts stated in euro cents per m^3 as of 2009. *Sources:* PBL (2010) on left and Geudens (2012) on right.

(Statistics Netherlands, 2011b; Eurostat, 2012). The supply of freshwater is usually greater than its demand, but the Dutch water exploitation index (percentage of freshwater used as a share of total available renewable resources) increased between the base year of 1990 and 2007 (EEA, 2010). According to Article 5 classifications from the European Union (EU) Water Framework Directive, 64 per cent of the Netherlands' surface water bodies have a 'poor' or 'bad' ecological (quantity) status, while 26 per cent have a 'failing' chemical (quality) status. The numbers for poor groundwater quantity and quality are 0 and 39 per cent, respectively (EEA, 2012).

EU numbers may capture the results of improvements made prior to the WFD era, as the Dutch enacted laws on groundwater quality in 1954 (*de Grondwaterwet waterleidingbedrijven*) and surface water pollution in 1970 (*Wet Verontreiniging Oppervlaktewateren*). Quantity management arrived a little later. According to Graveland (2011), command and control systems implemented in the 1970s reduced the impact of DWC and industry extractions on groundwater levels. These systems were supplemented and funded by the 1983 PGF and were affected by the 1994 GWT (both discussed below), but VROM (2001) notes continuing issues with groundwater status[1]. Some of these issues may result from exemptions given to farmers or from complications in monitoring their behaviour; for example, RIVM (2002) blames agricultural practices for 60 per cent of the drop in water tables. Such blame makes more sense when we consider that farmers in some parts of the Netherlands require lower water tables to keep roots dry, while farmers in other areas pump groundwater to irrigate their crops. Both of these actions reduce water tables below the higher (natural) levels that are better for the environment and biodiversity (Hellegers, 2001; Statistics Netherlands, 2011a).

Dutch water management

The Dutch have concentrated historically on flood protection and diverting water for economic uses (drinking, agriculture, industry and energy); water quality and groundwater scarcity have become more important in recent decades. The national government is responsible for coastal flood defences and other large-scale projects; provinces manage groundwater; and municipalities manage wastewater.

Water boards (*Waterschappen*, the oldest existing governmental bodies in the Netherlands) are responsible for managing water systems, purification and (sometimes) waterways in their catchments. Governance at water boards has changed since 1920, the last year in which landowners (usually farmers) had total control over managing water flows to protect and irrigate land. Residents now hold 70 per cent of the seats in the 25 Dutch water boards remaining after many mergers. Residents are joined by 'special interest groups' comprising farmers, businessmen or natural-area managers. Farmers are the largest group, with 13 per cent of seats – triple the share held by natural-area managers (Havekes, 2011).

Raw and treated waters go to different sectors in the Netherlands; see Table 1. DWCs sell nearly 90 per cent of treated water to households and industry. Raw water supplies go to DWCs that treat and sell it, industries whose quality needs vary, and energy companies that divert and return (part of) the water after using it for cooling. Measured agricultural consumption tends to be low, either because crops are watered by precipitation or because self-supplying farmers are exempt from monitoring, that is, their use is not included in Table 1. They are exempt due to the low volume of their abstractions or to a political decision to ignore their use.

[1] EEA (2012) and VROM (2001) may disagree for several reasons, the most important being that WFD reports are often based on data that are partial, qualitative and aggregated.

Table 1. Use of treated water and extractions of raw groundwater and surface water in 2008, in millions of cubic metres (MCM).

	Treated	Raw ground	Raw surface
Households	788	n/a	n/a
Farming, forestry and fishery	48	52	23
Mining	3	0	1
Industry	181	171	3,314
Energy companies	3	2	9,045
DWCs	0	762	490
Other	70	1	430
Totals	1,093	988	13,303

Treated water comes from dune water, surface water and groundwater. Note that energy companies (and some industrial users) extract and return water rather than consuming it. *Source:* Statistics Netherlands (2012).

Drinking-water companies

DWCs occupy a central role in our discussion because they provide a majority of GWT revenues. Dutch DWCs, like most water companies, provide water services as geographical monopolies. This fact, combined with the spatial distribution of water sources in the Netherlands, means that the majority of DWCs depends on groundwater sources, while some DWCs rely on surface sources. Table 2 shows, for example, that Waternet and Evides rely more on surface water, while Brabant Water and Vitens rely more on groundwater.

Water sources matter because DWCs using surface waters avoid the GWT and PGF, but they usually have higher treatment costs. Groundwater-dependent DWCs pass taxes through to customers, but they pay less for treatment. Although tax and treatment costs are not necessarily equal – Table 2 shows 2009 costs per cubic metre when the 20-cents-per-cubic-metre GWT was in force – they have absolute and relative impacts. From an absolute perspective, higher costs (thus prices) reduce quantity demanded

Table 2. DWCs, percentage of water sourced from groundwater, €/m^3 cost of water produced, and components of that cost.

	% Groundwater	Cost	(Taxes	+ OpEx +	Cap/Dep)
Brabant Water	100	1.17	0.22	0.77	0.18
WMD	100	1.29	0.21	0.70	0.38
Vitens	96	1.28	0.22	0.56	0.50
WBGR	85	1.16	0.19	0.74	0.23
WML	68	1.44	0.17	0.90	0.37
Evides	10	1.12	0.05	0.56	0.51
Oasen	10	1.58	0.21	0.95	0.42
PWN	6	1.57	0.03	0.98	0.56
Dunea	0	1.76	0.15	0.94	0.67
Waternet	0	1.52	0.05	0.91	0.56
Average	57	1.34	0.16	0.73	0.45

OpEx is operating cost; Cap/Dep is cost of capital plus depreciation. DWCs that use more groundwater have lower OpEx but higher taxes (due to the GWT). The correlation between % groundwater and OpEx is −0.53. *Source:* Accenture (2010, Figures 34 and 68).

as customers conserve more, install high-efficiency equipment and/or switch to self-supply. From a relative perspective, the implementation of the GWT may cause some industrial users to site their plants in the service area of a DWC that charges less.

These responses are not just theoretical. Households do not generally move to switch suppliers, but businesses can shift their demand by relocating. According to Geudens (2012), DWCs sell 27 per cent of their water and get 22 per cent of their revenue from business customers, who can get lower prices due to their larger demands as well as their ability to switch DWCs. The impact of such moves is magnified by the increase in competition for exogenously falling demand, that is, 'between 1995 and 2004 sales declined primarily among business users despite a growing economy and higher employment level. Reasons included water savings, water reuse and substitution of drinking water by other water as well as private water extractions' (Geudens, 2012, p. 23). DWCs such as Brabant Water, which sold 40 per cent of its water to businesses in 2011, are sure to track relative price changes (Geudens, 2012; see also Table 2 above). Ignoring other price changes that may have also occurred, the GWT's abolition would, for example, lower Brabant Water's average price from €1.17 to €0.97 per cubic metre, which would now be cheaper than surface-water-reliant Evides' charges of €1.12 per cubic metre.

Our main point here – and an important point in this paper – is that the DWCs did not see the GWT as a level or negligible cost: its relative burden on groundwater-reliant DWCs may have put them at a competitive disadvantage in terms of attracting business customers. This disadvantage is not irrelevant, despite DWCs' status as public corporations wholly owned by municipalities. DWCs compete on operational and financial terms for pride of place, and to return dividends to their municipal owners.

Provincial groundwater fees

The 1983 Groundwater Act has authorized provinces to recover the cost of managing groundwater since 1986. The PGF per cubic metre of extracted fresh or brackish groundwater varies among provinces (see the right frame in Figure 2) because the costs of designing policies, measuring use and reducing the impacts of groundwater abstraction or infiltration depend on local conditions, targets and so on (Jantzen, 2008; Spaermon *et al*., 2009).

The local nature of PGFs means that their efficiencies are hard to compare in terms of outputs or outcomes, since impacts vary from place to place. Their cost efficiency is also hard to measure, since the link between the cost of an action and its effectiveness depends on the local policy mix, actors and historical conditions. PGFs are also quite small, ranging from 0.81 to 2.75 euro cents per cubic metre of water; total PGF revenues were only 10 per cent of the GWT revenues of €170 million (Vermeend & van der Vaart, 1998). It is perhaps easiest to see the PGFs as a lubricant facilitating cooperation among water boards, provinces and stakeholders such as DWCs, farmers, environmental groups and industries.

The groundwater tax in theory, life and death

Proponents of the GWT promised it would simultaneously raise revenue and improve the environment, but such an outcome ignores the fundamental tension between the fiscal and behavioural impacts of taxes. In the next few subsections, we explore that tension, the complication of the GWT's interaction with the existing PGF, the actual environmental and economic impacts of the GWT, and the GWT's demise.

Raising revenue versus changing behaviour

Tax impacts depend on elasticity. At one extreme is a tax that changes elastic behaviour by altering relative prices; at the other extreme is a tax that raises revenue by targeting inelastic behaviour. Most taxes have an intermediate impact, altering some behaviour at the same time as they raise some revenue. The tension between these responses can be traced back to two Englishmen, Arthur Pigou and Frank Ramsey. Pigou (1920) was the first to discuss setting a tax to discourage activities that create negative spillovers. A basic 'Pigouvian tax' on groundwater use would be set to equal the negative impact of one person's pumping on an other's access to groundwater (i.e. their cost of additional pumping or lower groundwater levels). The GWT would be Pigouvian if it reduced demand for scarce groundwater. Ramsey (1927) approached the pricing problem from a different direction, arguing that taxes on price-insensitive behaviours are more efficient because they gather revenue without changing choices. The GWT would fit this criterion if it reduced the need to tax the elastic supply of labour or if it was levied on inelastic demand for water. We will see whether the GWT fulfilled both or either of these criteria after we cover its basic characteristics.

Designing and implementing the GWT

The GWT was proposed in 1992 when a failure to increase the fuel tax left a revenue gap in the national budget of NLG 425 million (€193 million)[2]. The search for other revenues led to an agreement to spread the tax burden across different groups of taxpayers and raise consumption taxes. After negotiations, the gap was closed with the passing of the Environmental Taxes Act of 1994, which targeted revenues of NLG 245 million (€111 million) from the GWT and the remainder of the revenue from a tax on waste (Vermeend & van der Vaart, 1998).

GWT rates have changed over the years. In 2011, the GWT per extracted cubic metre of fresh groundwater was €0.20 (roughly 10 times the average PGF per cubic metre). Users with combined installation for infiltration and extractions (often using sand dunes to filter water) paid €0.16; users returning extracted water to the same source paid €0.06 per cubic metre (Spaermon *et al.*, 2009).

The GWT was intended to tax 'bad' consumption of groundwater instead of productive activities (Vermeend & van der Vaart, 1998; ECOTEC, 2001; Pfeil, 2009), but this 'win–win' goal was weakened in the way the GWT was designed and implemented.

First, as Vermeend & van der Vaart (1998) acknowledge, low price elasticity would limit the GWT's impact on groundwater use, even as it enhanced its potential for raising revenue (the next subsections explore this tension). Second, there was no move to link groundwater levels to pre- and post-GWT behaviour, making it hard to know its impact on groundwater status. Although many uses were exempt from the tax due to their low impact, social value or their transaction costs[3], significant users were also given exemptions or reduced GWT rates.

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[2] We use the 1 January 1999 conversion rate setting NLG 2.20371 equal to €1.

[3] According to Vermeend & van der Vaart (1998), GWTs were not collected on pumps with a capacity of less than 10 m^3 per hour; temporary construction-related drainage and extractions; emergency facilities such as fire departments; soil and groundwater rehabilitation; closed-loop cooling systems; and ice rinks in meadows. The exemption for small pumps led some users to install multiple small pumps. This behaviour ended when the tax base was shifted from individual pumps to the total pumping capacity of the user (Vermeend & van der Vaart (1998); Spaermon *et al.* (2009)).

Table 3. Groundwater extractions and GWT payments in 2008.

Sector (units)	Extraction (MCM)	Extraction (%)	GWT revenue (%)	GWT payers (number)
DWCs	762	77	87	10
Industry	171	17	13	901
Farmers	52	5	0	n/a
Total	985	100	100	911

Note that Belastingdienst (2012) reported 14 DWCs, even though there are 10 in the Netherlands; they will not disclose the names of these 14 DWCs (confidentiality), but they may include bottled-water companies. *Sources:* Statistics Netherlands (2011c); Belastingdienst (2012).

Farmers were mostly exempted from the GWT due to political influence, a desire to minimize transaction costs, and the uselessness of taxing groundwater extractions when (conjoined) surface waters were nearby. Other reasons were more controversial. Farmers in water-abundant areas sometimes need lower groundwater levels to grow crops, but these levels may not be good for natural flora and fauna. Farmers subject to groundwater-management targets under existing PGF-funded programmes argued that an additional tax on groundwater use would duplicate or harm existing management practices. These last two reasons indicate that the GWT may not have been useful as a green tax (indeed, extractions for irrigation and sprinkling were exempt after 2006 under the assumption that these uses caused no environmental damage); the first three reasons indicate that they were able to evade or avoid its impact as a fiscal tax.

The GWT tax burden was therefore destined to fall on others. Exporting industries paid a lower GWT to safeguard their competitive positions until IWACO (1997a) recommended higher rates to promote efficiency, and the discount was removed by 2001 (ECOTEC, 2001). DWCs (33 at the time; 10 today) were left with the greatest burden. Their association, Vewin, sued the government at the European Commission, claiming that exemptions for farmers distorted competition, but they lost (Algemeen Dagblad, 1995; Vermeend, 2011).

In 2005, DWCs, industry and farmers, respectively, paid 80, 18 and 2 per cent of the GWT (IWG, 2007). By 2008, farmers were exempt, and 10 DWCs paid nearly 90 per cent of all GWTs. Table 3 compares groundwater extractions and GWT payments.

The cost of implementing the GWT was low, due to a Dutch cultural emphasis on obeying rules once consensus is reached (which can take time), the existence of an environmental-tax team to administer the tax, and an existing requirement to measure and report extractions for payment of the PGF (IWG, 2007). Indeed, IWG (2007) concluded that the administrative cost of the tax – €220,000 for business and €1.5 million for government – was low relative to its revenue of €170 million. It is therefore interesting that Werkgroep 16 (2010) claimed that these costs were relatively high only a few years later – a claim that would play a big part in the GWT's demise.

The GWT versus the PGF

It is difficult to know the different impacts and interactions between the GWT and PGF because they were assessed on partially overlapping groups and used for different purposes[4]. PGFs were paid by more

[4] A detailed, micro-data study of the interaction between these two parameters that clarified their interaction is beyond the scope of this paper, but it also wouldn't necessarily be representative.

groundwater users and varied with local groundwater-management needs (see Figure 2, right)[5]. The GWT was mostly paid by DWCs; its uniform rate dampened groundwater demand throughout the Netherlands. GWTs raised 10 times the revenue of PGFs for the national treasury; PGFs paid for local management interventions directed at flooding, groundwater losses, or both. The impacts of PGFs on groundwater, as mentioned above, varied with local conditions; the impacts of the GWT on groundwater were not measured as far as we know. The GWT and PGFs may also have interfered with each other. For example, the GWT may have functioned as an inverse Pigouvian tax by reducing pumping in places with excess groundwater.

Environmental impacts of the GWT

The main fact, as we have mentioned already, is that there was no effort to connect the impact of the GWT to groundwater levels, which are monitored throughout the Netherlands, but we have a better idea of its impact on demand for groundwater among users subject to the tax. In the first years after implementation, industry and DWCs with access to surface water reduced their use of groundwater and probably increased their water-use efficiency (IWACO, 1997a), but the Dutch Green Tax Commission (1998) concluded that the GWT did not have a big net impact on groundwater extraction. Figure 3 shows that DWCs – responsible for about 75 per cent of monitored groundwater extractions – used less

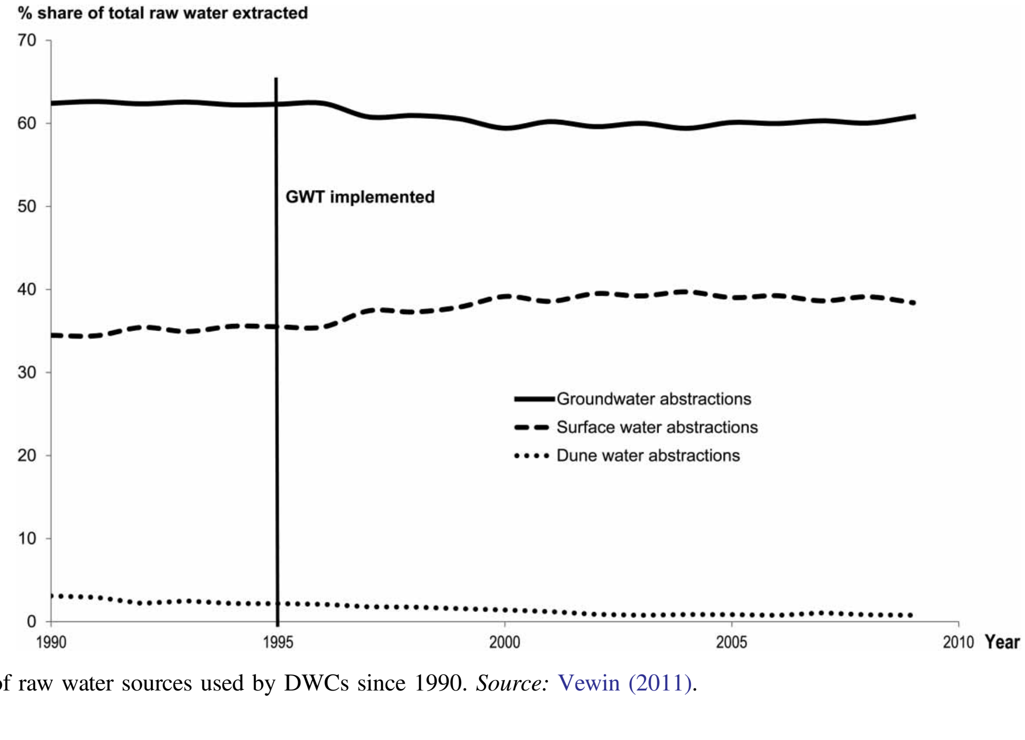

Fig. 3. Share of raw water sources used by DWCs since 1990. *Source:* Vewin (2011).

[5] There is some undocumented discussion of PGF discounts for DWCs managing their groundwater.

groundwater after the implementation of the GWT, but IWACO (1997a) reports that these gains were offset by increases in groundwater extractions by small-scale groundwater users whose actions are not included in statistics.

Decreased groundwater extractions may have lowered pressure on ecosystems, but it is hard to know how extractions impact the environment due to a lack of data for the following: connecting extractions to groundwater levels; the 'right' level for the groundwater table; the influence of rainfall, temperature, surface flows and other natural factors on groundwater levels; the non-monotonic relationship between groundwater levels and ecosystem health; and the impacts of PGF-financed groundwater management, the 1992 Water Savings Action Plan, demand from exempt users, and technological reductions in industrial demand (Vermeend & van der Vaart, 1998; Spaermon *et al.*, 2009; Graveland, 2011; Graveland and Baas, 2011, 2013).

All of these factors are relevant but hard to separate. The government assessed the effect of this 'green' tax on the environment only once (IWACO, 1997a) – finding that it had a modest positive impact at the same time as other actions may have helped or harmed groundwater levels – but reports produced 6 and 16 years after GWT implementation state that groundwater depletion and low groundwater levels were still major concerns (VROM, 2001; Statistics Netherlands, 2011a). These concerns can perhaps be traced to drainage by agriculture in the west and more weather extremes in the east, but we'll never know how the GWT affected local environments (Graveland, 2011).

Economic impacts of the GWT

The economic impacts of the GWT can be divided into a macroeconomic change in relative prices in which GWT revenues reduced taxes on productive (income-generating) activities; a microeconomic fall in demand for water (and indirectly for groundwater) by retail consumers; and a microeconomic impact on DWC operations, competition and lobbying. These effects are additional and complementary to the previously discussed increase in fiscal revenues of about €170 million per annum and difficult-to-measure reduction in demand for groundwater.

From a macroeconomic perspective, Vermeend & van der Vaart (1998) claim that the GWT (and other green taxes) made it possible to pay for additional spending without raising income taxes, shifting the tax burden from productive activities to resource-consuming activities. Unfortunately, neither we nor Vermeend & van der Vaart (1998) can find evidence linking the GWT to higher wages or employment. The absence of visible results does not mean that the GWT had no positive impact; it is just difficult to measure the impact of a small tax on a single input when decisions and operations combine many inputs with changing prices, taxes and relative contributions to profitability. That said, we should also note that the GWT raised the price of one input (groundwater) at the same time as it was supposed to lower the price of another (labour). Although the net impact of these price changes may be positive or negative in terms of overall economic efficiency, the jump in groundwater prices may have resulted in a disproportionate impact – and thus negative net effect – due to its visibility to DWCs, as discussed below.

The effect of the GWT on retail water demand probably varied by customer[6]. DWCs included GWT charges in volumetric prices, but it is not easy to identify a link between the GWT and the 1990–2009

[6] Per-resident fees for sewage discharges, sewerage networks and sewage treatment (*rioolheffing*, *rioolrechten* and *zuiveringslasten*) do not affect water use. Sewerage charges are collected by municipalities; sewage treatment is handled by water boards.

reduction in the quantity of freshwater demanded by residential and industrial customers, as demand was also influenced by a tax on tap water, a Water Savings Action Plan, increased awareness of water consumption, the PGF, and other factors (ECOTEC, 2001; Bots, 2008; Spaermon *et al.*, 2009; Vewin, 2011; Graveland, 2011). Industrial demand for water may have fallen for customers who could shift to self-supply or even another water company, or it may not have fallen at all, since water accounts for only 0.3 per cent of the total industrial costs (IWACO, 1997b).

The biggest microeconomic impact of the GWT occurred at DWCs. On the intensive margin, DWCs with choices may have substituted more raw surface water for groundwater, but surface water treatment costs roughly 20 euro cents more per cubic metre (Accenture, 2010). This difference in operating costs – combined with existing capital investments and operating procedures – explains why the 20-cent GWT may not have had a big impact on DWC choices of water sources. The result, therefore, was that DWCs raised their prices to include the GWT, but the average increase of 10 per cent hides significant variations (increases ranged from 2 to 19 per cent) resulting from source heterogeneity. Those variations explain the GWT's impact on the extensive margin. Groundwater-intensive DWCs worried that they would 'lose commercial customers to other companies' (Kloosterman, 2013). The unequal burden of the GWT – as opposed to the BTW (Dutch value added tax) that all DWCs paid – meant that it was not Ramseyan. It fell on a narrow base of payers with an incentive to collectively oppose its existence – as discussed in the next subsection (Olson, 1971).

The death of an inefficient tax

The government ended the GWT (and some other taxes) on 31 December 2011, claiming that it was inefficient in terms of administrative costs and ineffective at reducing environmental impacts (Werkgroep 16, 2010). Although both of these claims are, to a certain extent, true, they obscure the real problems with the GWT: it fell predominantly on a narrow group of payers and did not effectively target environmental outcomes.

The GWT's efficiency went from acceptable to unacceptable as its effective base narrowed over time. IWACO (1997a) noted the GWT's modest administrative burden while noting the heavier financial burden on DWCs. Ten years later, IWG (2007) confirmed the GWT's administrative cost was only 0.9 per cent on revenues of €160 million – lower than the national average of 1.1 per cent on tax revenues of €179 billion. These percentages are low because many groundwater users were exempt from the GWT, but Weekers (2011) – citing IWG (2007) – claimed that it was inefficient to collect the GWT from 4,000 payers. That claim was either incorrect or old, as Werkgroep 16 (2010) said that there were about 1,000 payers, while the tax collector reported 755–947 payers between 2005 and 2011 (Belastingdienst, 2012).

What is relevant, of course, is that only 10 DWCs paid nearly 90 per cent of the GWT, and their association complained that they carried the 'lion's share' of its burden (IJsinga, 2010). DWCs passed the GWT to their customers, but its uneven impact on groundwater-dependent DWCs, dampening of demand, and incentive for business users to switch to self-supply, other DWCs or to other countries made it unpopular.

However, those economic effects are not perhaps as important as the GWT's psychological impact on DWCs and on their municipal owners who felt singled out. In their annual report, Vitens (2012) celebrated the fact that the end of the GWT would reduce costs by approximately €70 million. Although 'money saved' was actually a transfer to the national treasury – and thus not lost at all – there is no doubt that Vitens, its customers and municipal owners were glad to see the end of the GWT. There is also no doubt – for the same reasons – that they would oppose a reformed GWT that fell solely on DWCs (thus removing the 'administrative inefficiency' from hundreds of smaller payers) because it would certify the GWT's uneven burden on groundwater-dependent DWCs as well as duplicate the role played by the existing, fairer tax on drinking water.

Although many held that the GWT was intended only as a means of raising revenue, others – as noted in the quotation at the beginning of this paper – saw it as a green tax that would improve groundwater conditions. There does not appear to be any evidence supporting this belief, at least as far as any studies or data linking the GWT to groundwater health. In any case, the presence and continued existence of the PGF make it unlikely that groundwater status will suddenly deteriorate.

Lessons learned

The Dutch are renowned for their sensible policies and sustainable water management, and this case study provides some insight for outsiders interested in the efficient application of both. Groundwater management is complex and local; the value of groundwater is rising as climate change increases the variation in natural flows, human demands and the importance of reliable reservoirs. Taxes, likewise, can be good at raising revenue or affecting behaviour, but not usually both. The Dutch national groundwater tax was presented as a 'green' tax that would simultaneously generate revenue (lowering tax pressure on labour and production) and improve groundwater conditions, but the green label may have been more about marketing than the environment. In practice, the incidence of the GWT undermined its effectiveness. The 10 DWCs that paid nearly 90 per cent of the GWT had an incentive to oppose it.

We saw in this case study that a tax on groundwater extractions can have uneven impacts on users with access to surface water sources, that taxes are not synonymous with targeting the correct levels of demand or groundwater, and that effective fiscal taxes often make ineffective Pigouvian taxes. We can also see how Dutch attempts to reduce the impact of the GWT on sensitive or marginal users (such as farmers or small businesses) converted the GWT from a broad excise on all water users into an anti-competitive burden on a handful of Dutch DWCs.

From these lessons, we offer this advice. First, decide whether it is more important to raise money without changing behaviour or to change behaviour without raising money. Second, consider the marginal impact of a tax that interacts with pre-existing institutions. Third, remember that management or regulations may be more efficient than taxes in changing behaviour or outcomes. Fourth, do not tax special interests if you can tax a broader population. Fifth, monitor outcomes if there is an expectation of reaching a (green) policy goal. Finally, do not call a fiscal tax 'green'.

Acknowledgements

We thank Peter J.J.G. Geudens, Carlos M. Gómez, Cor Graveland, Rian Kloosterman, Jennifer Möller-Gulland, Michael van der Valk, Willem Vermeend, Davide Viaggi, Christophe Viavattene and three referees for their comments and assistance with data. Opinions and errors are ours. This research project has received funding from the European Community's Seventh Framework Programme

(FP7/2007–2013)/grant agreement #265213 project EPI-WATER 'Evaluating Economic Policy Instrument for Sustainable Water Management in Europe'.

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Received 10 July 2012; accepted in revised form 9 June 2013. Available online 1 August 2013