

Domestic Tradable Quotas:

A policy instrument for the reduction
of greenhouse gas emissions

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Domestic Tradable Quotas: a policy instrument for the reduction of greenhouse gas emissions

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The Domestic Tradable Quotas (DTQs) scheme is a recently proposed economic instrument designed to enable nations to reduce greenhouse gas emissions arising from *energy use*. This interim paper is divided into three parts. The first provides a brief description of DTQs based on the published literature.¹ The second sets out the rationale for, and the aim of, the current research. The third sets out the objectives of the research and the methodology being used to achieve these objectives.

Brief description of DTQs

The DTQs scheme is premised on the assumption that stabilising greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system will require very large reductions in global greenhouse gas emissions.² Furthermore it is assumed that these reductions will be achieved through some form of international agreement establishing binding national *emissions reduction targets*. The Domestic Tradable Quotas (DTQs) Scheme is a new instrument designed to enable nations to meet the component of their emissions reduction targets that is related to energy use.

A nation implementing a DTQs scheme establishes the maximum quantity of greenhouse gases that it can emit from energy use during any given year. This *carbon budget* is reduced year on year up to and including the year by which a nation must have achieved its emission reduction target.³

Each carbon budget is divided into *carbon units*, with, for example, 1 carbon unit representing 1 kg of carbon dioxide.⁴ A proportion of these units is allocated by government, *free* and on an *equal per capita basis*, to all adult citizens.⁵ This free allocation is known as the *Entitlement*. The remaining carbon units are allocated to firms and other organizations through a government-regulated auction.

All fuels and electricity are assigned a *carbon rating* based on the quantity of greenhouse gases (measured in carbon units) emitted by the combustion of a unit of each fuel and by the generation of a unit of electricity.⁶ When citizens and other end users purchase fuel or electricity, they

¹ DTQs were formulated by David Fleming (1996). This description is based on Fleming's most recent published work on DTQs (Fleming, 2000).

² For example, in its 22nd report, the Royal Commission on Environmental Pollution (RCEP) recommends that atmospheric concentration of carbon dioxide be stabilised at 550ppmv. Under the Contraction and Convergence approach advocated by the RCEP this would require cuts of 77% in UK emissions by 2100 (RCEP, 2000, p53, 56-7).

³ The *target year* is the year in which the national *emissions reduction target* must be met. By the target year, the carbon budget will constitute a designated proportion of the national *emissions reduction target*.

⁴ This is the definition of a carbon unit used by Fleming (1997 and 2000).

⁵ Fleming proposes that this should be equal to the proportion of total emissions from energy use resulting from citizens' direct purchase of fuel and electricity over a nominated period prior to the introduction of the scheme (personal communication, 11/10/01).

⁶ The carbon rating for electricity will vary with generation mix and efficiency.

surrender the number of carbon units corresponding to their purchase to the retailer. For accounting purposes, these units are passed up the supply chain and on reaching the primary energy producer are surrendered back to government. There is a national market in carbon units in which individuals and organizations with surplus units may offer them for sale to those wishing to purchase additional units.⁷

Central to the DTQs scheme is a computer database which holds the *carbon unit account* for all citizens and organizations, The database records all carbon unit transactions – issuing, surrendering, buying or selling. All transactions are conducted electronically. For example, a customer purchasing petrol would simply have their ‘smart card’ swiped by the petrol station attendant, thereby transferring the carbon units corresponding to their purchase from their carbon unit account to that of the company owning the petrol station. For those purchasers of fuel and electricity without carbon units to surrender at the point of sale, for example, foreign visitors and individuals who have used all their units, the relevant number of carbon units are simply purchased electronically on the national market by the fuel or electricity seller on behalf of the purchaser. The purchaser then pays the seller for these units and surrenders them in the usual manner.

The DTQs system is intended to be a stand-alone scheme and consequently does not require supplementary instruments to reduce greenhouse gas emissions in line with successive carbon budgets. Moreover, DTQs combine two modes for allocating emission rights. Within the *Entitlement*, the initial allocation is made explicitly by government, with any subsequent re-allocation the outcome of market mechanisms. Within the government auction, both the initial allocation of rights and any subsequent reallocation is determined through market mechanisms, with government administering the auction process.

Rationale and aim

DTQs represent a fundamental departure from the complement of existing and proposed instruments for controlling greenhouse gas emissions arising from energy use. However, whilst a preliminary specification and evaluation of DTQs is now in the public domain,⁸ there remains an absence of any detailed academic research into the scheme. Given the advantages claimed for DTQs⁹ and the recognition of the value of further research,¹⁰ this project aims

to contribute to the policy debate on climate change mitigation by providing a detailed academic evaluation of the appropriateness of DTQs as an instrument for reducing greenhouse gas emissions arising from energy use.

To provide such an evaluation, DTQs and other emissions reduction instruments (henceforth referred to simply as *other instruments*¹¹) are being assessed against the criteria of *equity*,

⁷ A Quota is the total number of carbon units held by an individual or organisation. These carbon units are tradable, hence the name Domestic Tradable Quotas.

⁸ See note 1.

⁹ See note 1.

¹⁰ Letters expressing support for further research into DTQs have been received from the following individuals and organisations: Herman Daly, George Monbiot, the Tyndall Centre and the Environmental Change Institute, University of Oxford.

¹¹ Using the OECD’s system of classification (OECD, 2002) *other instruments* consist of: fiscal policies, tradable permits, regulatory instruments (e.g. efficiency standards), voluntary agreements, R&D policies and policy processes. For a comprehensive survey of emissions reduction instruments in use within the OECD, see OECD (2001, 2002). For a helpful discussion on instruments see Krause (2000).

effectiveness and *efficiency*. These criteria have been chosen as they are well established as appropriate for assessing environmental policy instruments.¹² The results of the assessments are to be compared so as to assess the relative appropriateness of the DTQs scheme.

DTQs and *other instruments* are now discussed in relation to the above criteria.

Equity

DTQs differ substantially from *other instruments* in their allocation of emission rights relating to citizens' direct purchase of fuel and electricity. Under *other instruments* these emission rights are effectively allocated on the basis of citizens' ability and willingness to pay,¹³ whereas under the *Entitlement* they are explicitly allocated on an equal per capita basis.

Whilst there is considerable support for allocating emissions rights *between* nations on an equal per capita basis,¹⁴ there has been little or no discussion as to whether this allocation should be applied *within* nations. Consequently no attempt has been made to ground such an allocation within the academic literature on distributive justice.¹⁵

Three of the leading approaches to distributive justice are egalitarian liberalism, libertarianism and communitarianism.¹⁶ This project is assessing the equity of the *Entitlement's* equal per capita allocation from the perspective of these approaches.

A provisional reading of the egalitarian liberal literature suggests that it supports the equal per capita allocation of emissions rights within the *Entitlement*. Specifically, this reading suggests that whilst some or all of the individual theories that comprise this approach may require differing allocations of greenhouse gas emissions rights to individuals, the equal per capita allocation of the *Entitlement* will be significantly closer to these allocations than either the present tacit allocation of emissions rights or those that would result under *other instruments*.

With its emphasis on autonomy and rejection of end-state views of justice, libertarianism appears not to offer the same support for the *Entitlement's* equal per capita allocation.¹⁷ Arguably, however, support for something approaching an equal per capita allocation of emissions rights can also be derived from the libertarian view of the relationship between innovation and economic welfare.

Communitarianism, on the other hand, rejects the moral individualism of both the egalitarian liberal and libertarian approaches, regarding all values as being embedded in a particular social or community culture. According to communitarianism, each community has its own concept of justice and it is not possible to arrive at a trans-community theory of justice which stands above and

¹² Gunningham and Grabosky (1998, pp25-31).

¹³ It is acknowledged that a carbon tax cannot be based purely on ability and willingness to pay and that rebates and adjustments in other taxes and benefits are needed to ensure that those on low incomes are not financially disadvantaged.

¹⁴ The equal per capita allocation forms the basis of the "Contraction and Convergence" proposal (Meyer, 2000). The RCEP endorses this proposal on the basis that "*every human is entitled to release into the atmosphere the same quantity of greenhouse gases*" (RCEP, 2000, p2). For an extensive list of those who support the Contraction and Convergence proposal see Meyer (2000).

¹⁵ However, this literature is increasingly being applied to the allocation of emissions rights *between* nations. See, for instance, Muller, (1999, 2001) and Neumeyer (2000).

¹⁶ See for instance Campbell (2001) and Callinicos (2000).

¹⁷ The most quoted libertarian work is Nozick (1974). For more recent libertarian writings see, for instance, Narveson (1989, 1997) and Mack (2002a, 2002b).

judges the beliefs and attitudes of particular cultural communities.¹⁸ The project is exploring the implications for emissions rights allocation of this approach to distributive justice.

Effectiveness

The effectiveness of a greenhouse gas emissions reduction instrument is the extent to which it achieves an agreed emissions reduction target.¹⁹ For an instrument to be effective it must be both feasible to implement and command a sufficient degree of public acceptance. Within this project the two facets of effectiveness being examined are *technological feasibility* and *public acceptability*.

Technological feasibility

The successful operation of a DTQs scheme will require the construction of a secure and reliable database to precisely record the various carbon unit transactions of tens of millions of citizens. Moreover, it will be necessary to introduce various technologies to allow citizens and organizations to access their carbon accounts in real time and easily buy and sell carbon units in the national market. Whilst a provisional assessment suggests that DTQs are technologically feasible using present day information technology,²⁰ a more detailed evaluation is currently being conducted.

Public acceptability

The fuel protests of 2000 illustrated the public antipathy that can arise in response to even small rises in carbon taxation;²¹ such antipathy would likely escalate if substantially higher levels of taxation were introduced to bring about significant emissions reductions. DTQs may provide an opportunity to mitigate such antipathy through the explicit inclusion of citizens in the task of emissions reduction. Rather than confronting citizens with higher prices, the *Entitlement* actively enlists them as environmental stakeholders through the direct allocation of emissions rights. Moreover, citizens are made equal stakeholders through the equal per capita allocation of the *Entitlement*. It is probable that the public will perceive this equal allocation to be broadly fair; a perception that is likely to contribute significantly to public support for DTQs.

Efficiency

In the context of policy instruments, efficiency is a measure of the economic cost at which a given result is achieved.²² According to neo-classical economic theory, emissions taxes and tradable emissions rights are the most efficient means of emissions reduction under the ideal conditions of perfect competition.²³ Ultimately, however, “*practical choices between... instruments, should be based on how well each instrument copes with the way the real world departs from the ideal conditions*”.²⁴ Therefore, any meaningful assessment of the efficiency of DTQs and *other instruments* will necessarily take into account the many ways in which the real world departs from

¹⁸ Campbell (2001 p43).

¹⁹ Gunningham and Grabosky (1998, p25). Tradable emissions rights schemes are effective in that they set the level of emissions directly. By contrast, taxes seek to influence emissions through price and therefore under a tax regime it is likely that an emissions target will only be achieved “*following a long, iterative procedure*” (Tietenberg, 2001).

²⁰ Fleming’s initial assessment consisted of discussions with various academics specializing in database technology (personal communication, 14/10/01).

²¹ These protests caused one former government advisor to remark that they had “*driven a stake through the heart of any new proposals for British, or indeed European, carbon or energy taxes*” (Burke, 2000).

²² Gunningham and Grabosky (1998, p26).

²³ See Baumol and Oates (1971) and Montgomery (1972). Pezzey (1992) lays out the symmetry between taxes and tradable rights in a particularly useful way.

²⁴ Pezzey (1992).

perfect competition. To this end an assessment is underway of issues such as administrative, transaction, monitoring and enforcement costs (static efficiency), and the extent to which each instrument will induce technological innovation and diffusion and foster behavioural, institutional and structural change (dynamic efficiency).²⁵

Scope of work currently ongoing and objectives still to be conducted.

Objective 1

To assess the equity of the allocation of emissions rights under DTQs and under other instruments.

This assessment is applying the academic literature on distributive justice to the allocation of emissions rights *within* a nation. The assessment consists of two stages. First a detailed appraisal of the allocations of emissions rights that reflect the leading approaches to distributive justice.²⁶ Second, the equity of the allocations under DTQs and *other instruments* by comparing them with those arising from the leading approaches.²⁷

Objective 2

To assess the technological feasibility of implementing DTQs.

This objective is assessing whether it is possible to construct, using current information technology, a database and network that can accurately record all carbon unit transactions, operate at the required level of reliability, offer adequate protection against possible fraud, allow the easy buying and selling of carbon units and permit access to carbon unit accounts in real-time. In addition, it is establishing whether it is possible to construct a rating system that can adequately reflect fluctuations in the electricity generation mix. This assessment consists of a combination of desk study and interviews with relevant IT and energy specialists.

Objective 3

To assess the likely efficiency of DTQs and other instruments in reducing greenhouse gas emissions from energy use

This assessment comprises two parts. The first is the production of “order of magnitude” estimates of the set-up and running costs of DTQs and *other instruments* (static efficiency). For DTQs, these include, for example, the cost of designing, installing, maintaining and efficiently operating the central database and other necessary information technology systems. By contrast the set up and running costs of, for instance, a carbon tax, include the costs of calculating and iteratively adjusting

²⁵ See Opschoor and Turner (1994).

²⁶ As mentioned earlier, these are egalitarian liberalism, libertarianism and communitarianism.

²⁷ For example, if the allocation under instrument X is closer to the egalitarian-liberal allocation(s) than the allocation under instrument Y, then, from an egalitarian-liberal perspective, instrument X can be said to be the more equitable than instrument Y.

the required tax level²⁸ and of designing and implementing measures to prevent those on low incomes from being financially disadvantaged by the tax.²⁹ The second part consists of an evaluation of the degree to which each instrument will induce technological innovation and diffusion, and foster behavioural, institutional and structural change (dynamic efficiency).

The assessment consists of a desk study drawing on the growing economic literature on environmental policy instruments, including the ongoing work of CATEP.³⁰ In addition, interviews are being conducted with relevant experts in academia and government. (Those interviewed include the IT experts consulted under Objective 3 who are also contributing to the process of estimating the IT costs of DTQs.)

Objective 4

To assess the public acceptability of DTQs and other instruments by running a series of focus groups³¹

This assessment has yet to begin but will use six focus groups each with eight participants. Groups will meet once a week for three weeks.³² Each of the three sessions will run for two hours and will take place in the early evening, enabling those in full-time employment to take part.

In the first session, participants will be briefed on the causes and impacts of climate change and on the various technological, organisational and behavioural options for reducing society's greenhouse gas emissions.

In the second session, the participants will be given a presentation on the instruments proposed for reducing greenhouse gas emissions and how they can motivate society to adopt the various technological, organizational and behavioural options described in the first session. Drawing on the research carried out under Objectives 1-3, this presentation will include a summary of the equity, effectiveness and efficiency of DTQs and *other instruments*. At the end of the session, participants will receive a briefing pack containing a short description of the various instruments described during the session and a series of *storyboards* illustrating how these various instruments might impact on their lives.³³ The participants will be informed that it is necessary that they read the pack prior to the third session.

By the third session, the participants will be familiar with the issue of climate change and with the various emissions reduction instruments. They will therefore be in a position to contribute to an in-depth discussion of the benefits and shortcomings of the various instruments. Each discussion will be led by an experienced facilitator and a member of the project team will make notes on the mood,

²⁸ See note 20.

²⁹ See note 13.

³⁰ CATEP is the Concerted Action on Tradable Emissions Permits. Funded by the EU, it aims "to uncover the state of the art in relation to the application of tradable permits, to inform European environmental policy". See www.ucd.ie/~envinst/envstud/CATEP%20Webpage/intro.html.

³¹ This objective will build on the results from the PETRAS project which used interviews and focus groups to "assess patterns of support or hostility towards specific policies and general principals of ETR [ecological tax reform]" and "to identify specific objections to these policies and principles" (European Commission, 2001, p62). For further details on PETRAS see www.soc.surrey.ac.uk/petras.

³² In order to attract opinions from across the spectrum of energy users, participants will be recruited to represent a range of incomes as well as urban and rural constituencies. The sample will be gender balanced and as far as is practically possible, attempts will be made to recruit participants from a range of household types and family sizes.

³³ A storyboard is a fictional narrative used to illustrate to an individual or group of how the socio-technical conditions of a particular scenario might apply to them. Care will be taken to ensure that the storyboards give a balanced account of the various instruments to be assessed.

tone and emphasis of the discussion. All discussions will be recorded for later transcription. At the end of the session participants will complete a questionnaire designed to ascertain their views on the appropriateness of DTQs and *other instruments*.

These questionnaires, along with the transcripts and the notes taken by the project team, will be analysed both qualitatively and quantitatively.³⁴ This analysis will assist the development of a thorough understanding of how DTQs and *other instruments* are likely to be perceived by the general public, thereby contributing to the overall project aim of “*providing detailed academic evaluation of the appropriateness of DTQs as an instrument for reducing greenhouse gas emissions arising from energy use*”.

³⁴ The questionnaires will be composed using a Likert scale. Quantitative analysis will include uni- and bi-variate analysis. The qualitative analysis of transcripts and notes will include content analysis using NUDIST software.

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