Oxera

Environmental spending and tax policies

What is the impact on Jersey?

Prepared for States of Jersey

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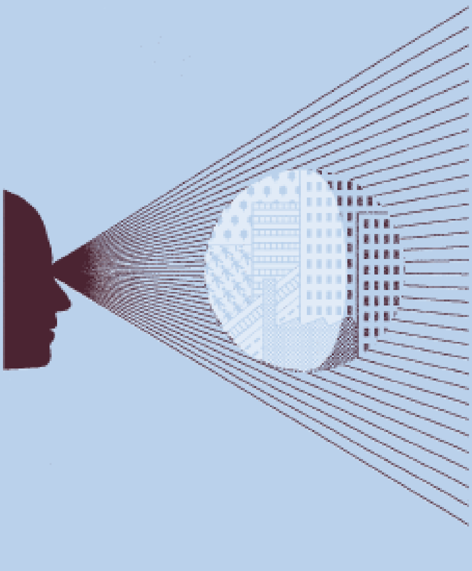

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Terms of Reference

To assist the Director of Environment to develop specific and costed tax policy proposals and associated spending packages that will achieve identified environmental objectives in the fields of:

– Waste policy;
– Transport policy;
– Energy policy (including assistance in deriving energy policy objectives for Jersey); and
– Land use policy.

To assess the impact and implications of these tax and expenditure measures and to fully understand their consequences throughout the economy.

1 Introduction

The purpose of this report is to explore the potential environmental and economic impacts arising from the introduction of a variety of environmental tax and spending packages in the States of Jersey. The analysis in this study is not intended to be an exhaustive evaluation of all the possible policies that could be employed, nor should the policies contained within the analysis be considered as being recommended by Oxera. Instead, the analysis focuses on providing a high-level evaluation of a set of policies, identified in conjunction with the Environment and Planning Department, with potential to contribute to Jersey's environmental objectives.

The approach taken in the analysis has been to identify a set of specific environmental objectives, outline a set of spending programmes that have been put forward to achieve these objectives, and then investigate the impact of the environmental taxes that would be required to fund these spending initiatives. The objectives and policies have been grouped into three categories covering energy, waste and transport. Within each of category the analysis has attempted to identify the impact of policies on:

– the achievement of the identified environmental objectives;
– other social and policy objectives;
– the distribution of costs and benefits within the economy and across the population.

In addition to the analysis of spending and tax measures related to energy, waste and transport, the report also includes a discussion of land development and land value taxes. However, these cannot be considered as environmental taxes in their own right.

The analysis in this report groups spending measures and related environmental tax measures together. This is because environmental taxes have the potential to help meet environmental objectives in their own right. If well designed, the method of raising revenue to fund spending schemes can therefore directly help to achieve the desired environmental objective. In purely economic terms, taxes will be effective at achieving environmental objectives if those causing the environmental harm show a significant behavioural response to the price or cost increase induced by the tax. If there is no behavioural response from the price rise, the direct impact of the tax on the environmental objective will be small or non-existent. This raises the possibility that the negative consequences of environmental taxation, including the distributional impact and the deadweight loss of the costs of collecting the tax, may outweigh the direct environmental benefits of the tax. Under these circumstances the economy may be better off using a non-environmental tax to fund the spending schemes if judged by economic criteria alone.

However, there may also be non-economic factors that could be relevant. In particular, the non-economic effects of linking an activity causing environmental damage to a tax that pays for schemes that reduce or eliminate that damage may make such expenditure more acceptable to the taxpayer. They may also help change behaviour through non-economic pressure by making the costs of the damage caused by the activity more visible and, for example, subjecting the damaging behaviour to more peer pressure.

In evaluating the use of environmental taxes, these non-economic factors should also be taken into account. They are, however, beyond the scope of this economic analysis.

2 Energy

2.1 Environmental objectives

Jersey's primary environmental objective relating to energy use is to reduce overall greenhouse gas emissions. While no formal specific target has been agreed for the extent of this reduction, the Environment and Planning Department has indicated an aspiration to achieve annual carbon reductions of approximately 8,300 tonnes of carbon equivalent compared with current base case emissions. This target is broadly consistent with reducing annual emissions to 12.5% below 1990 levels (excluding electricity production). It is anticipated that the majority of these savings will be achieved through reductions in emissions of CO_2, as opposed to other greenhouse gases.

There are three broad approaches that could be taken in reducing Jersey's carbon emissions:

– reducing overall energy consumption;
– decreasing the carbon content of the fuels used;
– offsetting Jersey's emissions through international carbon trading mechanisms.

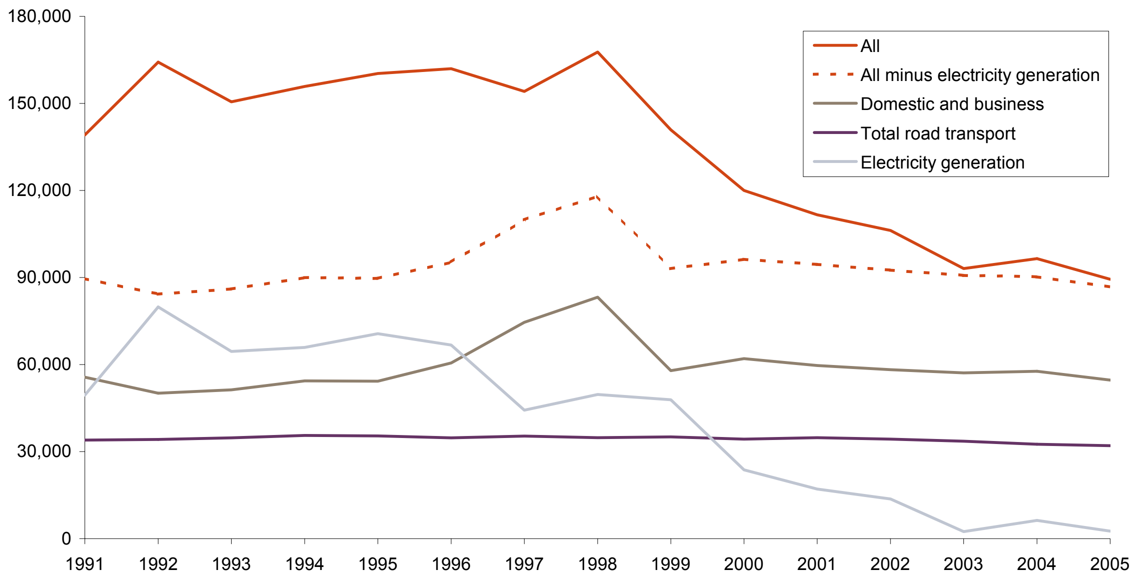
Each of these approaches will potentially require a different set of policy measures and mechanisms and are therefore likely to have different impacts on the wider Jersey economy, and on the achievement of other objectives. For example, measures to improve energy efficiency would contribute to the Strategic Plan objective of reducing per-capita consumption of resources and, if targeted correctly, could also contribute to reducing fuel poverty. By contrast, the use of international trading mechanisms would provide little in the way of direct benefits to the Jersey economy and would not reduce on-Island emissions, but it is likely to be one of the more cost-effective means of Jersey contributing to global reductions in carbon emissions.

While it might be possible to identify a preferred approach for Jersey, in practice it may be necessary to use a combination of approaches to achieve Jersey's carbon reduction targets. The approach taken within this analysis has been to first consider a potential set of spending packages that could deliver this carbon savings target, and then to investigate the impact of a set of energy-related taxes that could be used to fund this spending package.

2.2 Background

Compared with other developed economies, Jersey has relatively low levels of energy intensity and per-capita carbon emissions. This is due in part to the low reliance on energy-intensive industries within the Jersey economy, but has also been helped by the move away from on-Island electricity production towards electricity imports from France since 1999. Figure 2.1 shows that, apart from the significant reduction in emissions from electricity generation, energy-related carbon emissions remain relatively unchanged from 1990 levels. These emission figures also show that homes and businesses account for more than 60% of total emissions, with road transport accounting for the majority of the remaining emissions.

Figure 2.1 Energy-related carbon emissions (tonnes of carbon)



Source: Jersey Statistics Unit.

Although the reliance on French imports means that electricity consumption results in relatively low on-Island carbon emissions, Jersey's electricity use does have an impact on French electricity generation levels and hence global carbon emissions. While it is the case that the majority of French electricity is provided by nuclear generators with low carbon emissions, the French electricity system as a whole is not carbon-free. In 2003 the average carbon content of electricity generated in France was $0.07kgCO_2/kWh$.[1] Furthermore, as there is a high degree of interconnection between electricity markets across north-west Europe, it could be argued that the marginal carbon impact of Jersey's electricity consumption could actually be higher than this.[2]

If the intention of Jersey's carbon reduction objective is to contribute towards international efforts to address climate change, it is appropriate to consider the global impact of Jersey electricity consumption. If, however, the primary objective is to reduce on-Island emissions, it would be appropriate to assume close to zero carbon emissions for electricity consumption. For the purposes of this analysis, Oxera has assumed the carbon intensity of electricity consumption in Jersey to be equal to the average carbon intensity of the French system. The implication of this assumption with respect to Jersey policy is that, as the assumed carbon intensity of electricity consumption increases:

– the benefits of policies to reduce electricity consumption increase;
– the benefits of switching away from other fuels to electricity decrease.

Table 2.1 provides a summary of the carbon-intensity assumptions used for each of the four main forms of energy consumption in Jersey.

[1] Oxera calculation based on data from IEA Energy Statistics.

[2] As nuclear generation typically has low marginal costs, any reduction in Jersey's electricity demand would allow the French nuclear stations to sell more energy into other markets, thereby partially offsetting generation from fossil-fuel plants. Conversely, an increase in Jersey demand would reduce the amount of nuclear generation that could be sold to other markets and therefore potentially increase generation from fossil-fuel-fired stations.

Table 2.1 Carbon intensity of energy consumption on Jersey (kgCO_2/kWh)

Coal	Heating oil	LPG	Electricity
0.32	0.27	0.21	0.07

Note: LPG, liquefied petroleum gas.
Source: Defra and Oxera calculations based on IEA data.

These carbon-intensity assumptions have been used in conjunction with a breakdown of Jersey energy consumption from 2005 in order to provide an indication of the fuels with the greatest contributions towards total emissions. Table 2.2 shows that carbon emissions appear to be distributed relatively evenly across the domestic, industry and government, and road transport sectors, with the majority of all emissions resulting from the use of petroleum products.[3]

Table 2.2 2005 energy-related carbon emissions (tonnes of carbon)

	Coal and other solid fuel	Petroleum products	Gas	Electricity	Total
Industry and government	–	21,183	2,939	6,118	**30,241**
Air and marine	–	14,925	–	–	**14,925**
Road	–	32,821	–	–	**32,821**
Domestic	2,375	22,960	4,111	5,655	**35,101**
Total	**2,375**	**91,890**	**7,050**	**11,773**	**113,088**

Note: LPG, liquefied petroleum gas.
Source: Oxera calculations based on energy consumption data from Jersey Energy Trends 2005.

The reliance on petroleum products within the non-transport sectors is primarily due to the absence of natural gas in the Island's energy mix.[4] As the majority of this energy use is related to providing space and water heating, these non-transport sectors offer the greatest potential to reduce carbon emissions, through improving the efficiency of boilers, increasing thermal insulation levels, or switching to less carbon-intensive fuels.

2.2.1 Achieving carbon savings through energy efficiency

Most governments see energy efficiency measures as a key component in reducing carbon emissions, particularly from the domestic sector. In addition, by enabling less energy to be used for the same level of output (be that in industrial products or home heating), energy efficiency has the potential to contribute to other objectives such as increasing supply security, supporting economic growth through lower input costs and reducing fuel poverty.

In terms of the domestic sector, the greatest potential for energy efficiency comes from improvements in space and water heating, through measures such as retrofitting loft and cavity-wall insulation in houses, and improving the efficiency of domestic boilers. More modest, but still significant energy savings, could be achieved through energy-efficient lighting and household appliances. In terms of carbon savings, however, the relatively low carbon intensity of electricity consumption in Jersey means that these measures are likely to be less effective, although there may be some merit in pursuing these options simply to

[3] Note that the estimates in Table 2.2 do not align exactly with the emissions figures shown in Figure 2.1. This is partly due to minor differences in the energy consumption data, but most significantly because the emission figures that underpin the calculations of this figure as used by the Statistics Unit assume a CO_2 to carbon conversion factor of 3.792. Table 2.2 uses the atomic mass ratio of 44/12 as the conversion factor, which is equivalent to 3.6667.

[4] Although there is some reticulated gas in Jersey, this takes the form of imported LPG, which is then regasified on the Island.

reduce overall energy use.[5] Table 2.3 provides a summary of the estimated costs and benefits of the main energy efficiency measures available in Jersey. These estimates have been built up from a variety of sources, taking into account Jersey housing stock and heating types, and using estimates of insulation levels based on data from the UK's Build Research Establishment (BRE). There is little information on which to base estimates of the energy efficiency potential from the business sector and public sector. However, the similarity in energy use with the domestic sector, and the lack of energy-intensive industries, suggest that similar levels of energy and carbon savings could be achieved if the efficiency of space heating could be increased.

Table 2.3 Summary of domestic energy efficiency measures

	Loft insulation	Cavity-wall insulation	High-efficiency boilers[2]	Energy-efficient light bulbs
Per measure				
Installation cost (£)	240	260	173	4
Energy savings (kWh/year)	989	3,362	4,926	34
Energy cost savings (£/year)[1]	48	166	221[3]	2
Carbon savings (kg/year)	55	179	363	0.6
Total potential on Jersey				
Number of measures	21,062	15,006	11,662[4]	141,756[5]
Energy savings (GWh/year)	20.8	50.5	574.5	48.2
Carbon savings (t/year)	1,154	2,689	4,230	92

Notes: [1] Assuming delivered energy costs of 4.4p/kWh for electricity, 6.7p/kWh for gas and 4.48p/kWh for oil. [2] Estimates based only on households using oil-fired boilers. [3] Estimated cost difference between conventional and condensing boilers. [4] Assumes 80% of oil-fired households currently use conventional boilers with a 65% heat-conversion efficiency, and that these would be replaced by condensing boilers at 85% efficiency. [5] Assuming that four light bulbs are installed in each household.
Sources: Oxera calculations based on a variety of sources, including Jersey in Figures 2005, Jersey Energy Trends 2005, BRE (2006), 'Domestic Energy Fact File', and Ofgem's 'EEC 2005–08 Technical Guidance Manual'.

While in many cases the cost of installing energy efficiency measures would be recovered in the long run through lower energy bills, experience in other countries has shown that consumers are often unwilling to install these measures without significant subsidies. A recent assessment of the UK's Energy Efficiency Commitment (EEC) showed that, on average, 53% of the direct costs of the measures installed under the scheme were subsidised by electricity suppliers, and that 100% subsidies were required in some cases.[6] However, installation costs are not the only factor affecting the take-up of energy efficiency measures. A study conducted by Oxera as part of the UK government's review of energy efficiency indicated that, while the upfront costs of energy efficiency measures were important to consumers, other issues such as the 'hassle factor', distrust of the supply chain, and lack of awareness of the long-term benefits of measures, were also significant factors in the uptake of energy efficiency products.[7] As a result, the most effective energy efficiency programmes place significant emphasis on awareness-raising, information and education campaigns.

[5] If a higher rate of carbon emissions from electricity consumption is assumed, the benefits of energy-efficient lighting and appliances would be greater.

[6] Defra (2006), 'Assessment of EEC 2002–05 Carbon, Energy and Cost Savings', April.

[7] Defra (2005), 'Energy Efficiency Innovation Review: Summary Report', December.

2.2.2 Subsidising fuel switching

The high proportion (approximately 40%) of homes heated with oil in Jersey suggests that there could be potential for significant carbon savings through encouraging consumers to switch to less carbon-intensive forms of water and space heating, particularly electricity. In order for fuel switching to be attractive to consumers, it would have to result in lower unit energy costs. As Table 2.4 shows, the cheapest form of heating, night-rate electricity, is also the energy source with the lowest carbon emissions per kWh of effective heat, and therefore there could be some potential for fuel switching in Jersey. However, this potential could be undermined by future changes in energy prices. The final price of heat from the most efficient oil boilers is already quite close to that of night-rate electricity. A 10% reduction in oil prices relative to night-rate electricity would therefore erode the cost advantage of electric heating.

Table 2.4 Relative cost and carbon emissions for different fuel types in Jersey

Heating type	Heating efficiency (%)	Cost (p/kWh of effective heat)	Carbon emissions (kg CO_2/kWh of effective heat)
Coal open fire	32	13.20	1.00
Coal open fire with back boiler	55	7.68	0.58
Gas central heating with existing boiler	65	10.31	0.33
Gas central heating with combi boiler	73	9.18	0.29
Gas central heating with condensing boiler	85	7.88	0.25
Oil central heating with existing boiler	65	6.3	0.42
Oil central heating with combi boiler	79	5.2	0.34
Oil central heating with condensing boiler	85	4.8	0.32
Electricity standard domestic rate	100	8.52	0.07
Electricity E7 night rate	100	4.5	0.07

Source: Jersey Electricity Company and Oxera calculations.

A significant barrier to fuel switching is the upfront costs that would be incurred in changing supply infrastructure and appliances. While such barriers could potentially be overcome through subsidising these switching costs, the level of subsidy required is likely to be high.

Another factor influencing consumers' decisions regarding heating is the issue of comfort. Homes fitted with central heating are generally heated to a higher average temperature than those using spot heating options, such as electric or portable butane heaters. Some consumers place a significant value on this additional comfort, thereby reducing the incentives to switch to electric heating. While it might be possible to achieve similar levels of heating with electric night storage heaters, these heaters allow for less control over the timing of heat provision and so are not necessarily viewed as an equivalent substitute for central heating. Moreover, if some additional heating is required using standard-rate electricity, the cost savings of electric heating may not arise.

Notwithstanding the discussion above, the current relative fuel prices do provide some scope to encourage consumers to switch away from gas and oil heating. These incentives could be sharpened through promoting and/or subsidising night storage heaters and electric hot water cylinders. Using data from the 2005 Jersey energy trends, Oxera estimates that there are around 14,500 households in Jersey relying on oil-fired boilers for space and water heating. The average annual oil consumption of these households is approximately 21,000kWh (gross). Assuming that a conventional boiler is used, the average net heat consumption will be in the order of 14,000kWh. Assuming the same net heat demand is needed for night storage heaters, the annual cost savings for consumers switching to electric heating would be in the order of £250, and would achieve carbon savings of close to 1.3tC. However, if the oil-fired boiler is the latest condensing type, the cost savings are considerably lower—in the order of only £40 per year—and the carbon savings less than 1tC, reflecting the increased efficiency of the condensing boiler.

These estimates suggest that the overall financial incentive for consumers to switch to electric heating from oil is relatively small in many cases. Even where the potential savings are significant, for the reasons set out above, the actual savings may be lower if some of the heating load in the electrically heated house is satisfied by full-price electricity. Therefore, to make fuel switching contribute to the achievement of any carbon-reduction objective, it is likely that an additional incentive—in the form of a subsidy for electricity, or a tax on oil (or both)—would be required.

2.2.3 Road transport and aviation emissions

Carbon emissions from the road transport and aviation sectors are likely to be more difficult to address due to the relatively low impact that fuel costs have on private vehicle use and the ability of the aviation sector to avoid any Jersey-based tax measures.

The impact of fuel duty taxes for road vehicles is discussed in section 4 in terms of its revenue-raising capacity and the impact it could have on vehicle use. A similar approach based on taxing aviation fuel is unlikely to be workable, since airline operators would simply refuel off the Island. Other approaches, such as passenger charges or levies on aircraft movements, might be less avoidable. However, as demand for air travel is relatively insensitive to price, high levy rates might be required in order to make any material difference to demand for flights and thereby to aircraft emissions from flights to and from Jersey. In addition, an application of tax in Jersey is unlikely to have much impact on the aircraft being used (ie, to induce switching to more fuel-efficient aircraft), so any reduction in emissions would need to arise either from a reduction in the frequency of services or the use of smaller aircraft, which may have higher emissions per seat-km. Furthermore, levies applied only to Jersey routes are likely to have little impact on the global aircraft emissions, even if they succeeded in reducing the emissions on routes to and from Jersey. This is because potential inbound tourists discouraged from flying to Jersey by higher flight costs may substitute alternative destinations that involve an equal (or even greater) emission of carbon. The impact of a Jersey levy on *global* carbon emissions would probably have to come mainly from Jersey residents who fly less often, or who take ferries for their journeys. Finally, levies that were effective in reducing demand for air travel to and from Jersey are likely to have a significant detrimental impact on the Jersey tourism industry. For these reasons, Oxera has not considered any explicit measures targeted at the aviation industry.

2.3 Spending packages

It is understood that Jersey is currently in the process of developing a detailed set of energy policies that will address, among other issues, programmes to improve energy efficiency and reduce energy-related carbon emissions. Prior to the development of these policies, it is difficult to make any firm estimates of the level of spending that would be required in order to meet the carbon-reduction targets set out above. However, it is possible to provide a broad indication based on comparisons with other energy efficiency and carbon-reduction programmes, most notably the UK's EEC. An alternative spending approach would be through purchasing Certified Emission Reductions (CERs) on the international market. The implications and level of funding required under each of these approaches are discussed below.

The spending options considered in this paper represent a high-level analysis of two potential approaches that could be employed on Jersey. This is not a comprehensive analysis of all potential options, nor a recommended set of spending policies. Instead, the objective of this section is to provide a broad indication of the potential impacts of spending programmes and the likely level of funding required.

2.3.1 Spending programme based on the UK EEC

The EEC is an obligation on electricity and gas suppliers to achieve fixed targets for the promotion of improvements in domestic energy efficiency. The first EEC period (2002–05) is expected to deliver annual carbon savings of 0.49MtC through a combination of measures including subsidising the cost of insulation, boiler upgrades, fuel switching and energy-efficient appliances, as well as promoting various energy-efficient products.[8] It has been estimated that the total cost to energy suppliers of achieving these carbon savings was £410m, of which £323m took the form of direct subsidies, with the remaining £87m representing suppliers' indirect costs, relating to marketing, administration and monitoring.[9] The average cost of delivering carbon savings through the EEC has been approximately £840 per tonne of carbon saved per year.

Clearly there are differences between the UK and Jersey in terms of energy use patterns and the nature of the housing stock. However, the EEC figures provide a reasonable basis for estimating the costs of a Jersey-based energy efficiency programme. While Jersey's higher reliance on oil-fired space and water heating might suggest the potential for greater carbon savings as a result of insulation and boiler efficiency measures, these are likely to be offset by higher average temperatures and a lower assumed level of carbon emissions from electricity consumption.

Using the EEC cost-effectiveness figure as a starting point, Oxera estimates that Jersey could achieve its carbon-reduction target of 8,300t/year at a total cost to the government of around £7m. In addition to government expenditure, the EEC analysis suggests that energy consumers would also need to contribute around £4.8m in order to achieve these savings. This total expenditure of around £12m would be more than offset by the reduction in energy costs, which Oxera conservatively estimates to be around £60m over the lifetime of the measures.[10]

It is likely to take several years before the delivery of carbon savings through an energy efficiency programme would reach the 8,300tC/year target. Oxera has therefore assumed that the funding requirements for this approach will be around £1.4m per year over a five-year period.

2.3.2 Purchasing Certified Emissions Reductions

Although Jersey is a signatory to the UN convention on climate change, it has no specific carbon-reduction targets of its own, and already has relatively low levels of per-capita carbon emissions. Therefore, if the main intention of Jersey's greenhouse gas objective is to contribute to global emissions reductions, the most efficient and effective way to achieve this might be through the use of the flexibility mechanisms within the Kyoto Protocol rather than by reducing its own, on-Island, emissions. The most prominent of these, the Clean Development Mechanism (CDM), allows developed countries to invest in climate change mitigation projects in the developing world and claim the emission reductions of these projects against their own targets.

There is a relatively deep and active international market in carbon savings arising from CDM projects, which would currently allow Jersey to purchase CERs for around £33/tC.[11] This approach would allow Jersey to meet its carbon-reduction target at an annual cost of around £275,000. However, in contrast to investments in energy efficiency, this would approach would represent an ongoing cost to the economy rather than an upfront investment in energy

[8] Defra (2006), 'Assessment of EEC 2002–05 Carbon, Energy and Cost Savings', April.

[9] Eion Lees Energy (2006), 'Evaluation of the Energy Efficiency Commitment 2002–2005: A Report to Defra', February.

[10] This estimate has been made by pro-rating the £3.7 billion energy cost savings estimated for the EEC down to the Jersey carbon-saving target. As the cost of energy products in Jersey are generally higher than in the UK, this approach is likely to underestimate the cost savings that could be achieved on Jersey.

[11] Source: Point Carbon (2006), 'CDM and JI monitor', September.

saving. A comparison between these two approaches can be made based on the net present value (NPV) of purchasing CERs across the expected lifetime of energy efficiency measures that could be employed. Oxera has estimated this NPV to be approximately £3.9m based on a real discount rate of 3.5% and a 20-year period.[12]

2.3.3 Comparison of spending options

While the above analysis suggests that purchasing CERs might be a less costly approach for Jersey to reduce global carbon emissions (£3.9m compared with £12m), there are several drawbacks. The most significant of these is that buying CERs would impose a cost on the Jersey economy without providing any direct benefits. By contrast, measures to reduce on-Island energy consumption will result in significant energy cost savings (£60m) and at least some proportion of the costs of these measures would be recycled within the Jersey economy (eg, the economic activity of installing cavity-wall insulation). Overall, the economy of the Island is likely to benefit more by installing energy efficiency measures rather than buying CERs, even at this low price.[13]

Another disadvantage of relying on CERs is that it would leave Jersey exposed in the long term to movements in the international price of these credits. While the cost of CERs are currently quite low due to the relatively high availability of projects, there is a possibility that prices in the future could increase as the cheapest options begin to be fully utilised. For these reasons Oxera has assumed that Jersey's spending programme is more likely to focus on local energy efficiency measures rather than international carbon trading.

2.4 Energy-related environmental taxes

The discussion above indicated that it would be necessary to raise £1.4m per annum in order to fund an energy efficiency programme on Jersey capable of delivering the Island's carbon-reduction target of 8,300tC per year over a five-year period. One way in which this funding could be provided is through the introduction of additional taxes on energy consumption. In addition to funding the energy efficiency measures, such taxes could also make a direct contribution towards the carbon-reduction targets by providing an incentive for consumers to reduce energy demand or, depending on the design of the tax, to switch to less carbon-intensive fuels. A downside of these taxes is that, by increasing energy purchase costs, they could potentially increase the incidence of fuel poverty in Jersey. This section investigates the likely tax rates that would be required, the direct impact of these rates on energy demand and carbon emissions, and the distributional impact of energy consumption taxes.

2.4.1 Required tax rates

If the primary objective of energy consumption taxes is to raise sufficient revenue to fund the energy efficiency programme, the simplest approach might be to increase the GST rates for energy products. Oxera estimates that £1.4m could be provided with an additional 1.3% tax on all non-transport-related purchases of energy products.[14] While a simple flat rate of tax based on the GST system might benefit from relatively low additional administrative burdens, the revenue raised would be sensitive to changes in energy prices. Regular reviews of the tax rates would be required in order to ensure that the tax generated an appropriate level of revenues.

[12] This discount rate is consistent with the UK Treasury 2003 Green Book, 'Appraisal and Evaluation in Central Government'.

[13] This difference between buying CERs and installing energy efficiency measures arises because the energy efficiency measures are mainly economic in their own right. Unless there are very large economic costs for consumers that have not been captured in the analysis, there is no net economic cost to the Island in putting these measures in place, irrespective of whether the measures would also deliver any environmental benefits either locally or globally.

[14] This figure has been calculated according to an estimated total value of non-transport-related energy consumption of £105m in 2005.

Another drawback of a flat tax rate approach is that it would not necessarily target the tax towards the most carbon-intensive forms of energy use. An alternative mechanism would be to levy taxes on the basis of the carbon content of the fuel, in effect a carbon tax. Table 2.5 provides a summary of the effective tax rates required under each of these mechanisms in order to raise £1.4m per annum. Not surprisingly, taxes targeted at the carbon content of fuels would result in higher rates for heating oil and coal and lower rates for electricity than the flat-rate tax approach.

Table 2.5 Tax rates under different options

	Electricity	Gas	Heating oil	Coal
Annual consumption (GWh)	617	123	717	27
Current price (p/kWh)	8.52	6.7	5.7	11.5
Flat tax				
Tax rate (p/kWh)	0.11	0.09	0.08	0.15
Tax rate (%)	1.3	1.3	1.3	1.3
Implicit carbon value (£/tC)	59.7	15.7	11.6	17.6
Carbon tax				
Tax rate (p/kWh)	0.04	0.12	0.13	0.18
Tax rate (%)	0.5	1.8	2.4	1.6
Implicit carbon value (£/tC)	20.5	20.5	20.5	20.5

Source: Oxera calculations.

While carbon taxes would provide a better reflection of the carbon impact of energy consumption, the tax rates shown in Table 2.5 would not provide a significant incentive for consumers to switch to lower carbon-content fuels. Another approach that has been suggested is to create fuel-specific tax rates to equalise the cost of heating to that of the lowest carbon option (electricity); however, there would be a number of problems associated with such an approach.

At current prices, and taking into account the conversion efficiency of different heating types, night-rate and convector heaters would be charged the higher-standard domestic rate, and the tax rates required to make this competitive with heating oil are unlikely to be acceptable to the public. Table 2.6 shows the tax rates required to equalise the cost of fossil-fuel heating with standard domestic-rate electricity.

Table 2.6 Impact of taxes based on cost equalisation

Fuel	Cost per useful kWh (p)[3]	Effective tax rate (p/kWh input)	Implicit carbon tax rate (£/tC)	Total revenue generated (£m)
Electricity	8.52	0	0	0
Gas[1]	7.88	0.54	95	0.7
Heating oil[1]	4.82	3.14	480	22.5
Coal[2]	7.45	0.69	80	0.2

Notes: [1] Based on new condensing boiler with 85% thermal efficiency. [2] Based on open fire with back boiler. [3] Based the Jersey Electricity Company August fuel cost comparison.
Source: Oxera calculations.

The analysis suggests that these cost-equalising taxes would mostly be targeted at heating oil, and could raise revenues in excess of £23m per annum. In order to achieve this price equalisation, however, the tax rates on heating oil would have to be extremely high, approximately 65%. It is questionable whether such high rates of tax would be politically acceptable. The implicit carbon value implied by the tax on heating oil would also be significantly in excess of the size of the negative externality that the tax is designed to address.[15] A further drawback of price-equalising taxes is that the rates applied to different fuels would need to be periodically adjusted to account for movements in the prices of different energy sources. Such adjustments could increase the administrative costs of the tax and result in uncertainty over future revenue levels.

Such tax rates would also be expected to result in quite significant changes in fuel use, as full-price electricity (which all households will already have access to) becomes the cheapest fuel, and would be significantly cheaper than existing, non-condensing, oil- and gas-fired central heating and open coal fires without back boilers. Cheap-rate electricity (ie, night storage heating) would be significantly cheaper than any other form of heating, and in the long term it would be expected that most heating would change to cheap-rate electricity. This would reduce the tax-take significantly, but would also significantly reduce carbon emissions. On balance, however, Oxera has assumed that administrative difficulties and high rates of tax on heating oil mean that this approach is unlikely to be adopted in Jersey. The remainder of this section therefore concentrates on the potential impacts of the flat tax and carbon tax options.

2.4.2 Impact on energy demand and carbon emissions

The application of a tax on energy consumption can have a number of impacts. By making fuel more expensive, consumers will, to some extent, consume less of it, which directly reduces demand. However, this also reduces their welfare because the benefit derived from the fuel use is also reduced. With an increase in the price of fuel, consumers may also choose to invest in energy efficiency measures because the economic payback on these investments improves. Expenditure on fuel still declines, but the loss of welfare is lower, since the fuel that is consumed delivers greater benefits. Finally, if the tax creates a change in the relative price of fuels, consumers may also switch between fuels, as well as reducing their overall consumption.

While it is generally accepted that energy consumption is relatively insensitive to changes in price, various econometric studies have indicated the own-price elasticities for energy products to be significantly different from zero.[16] While most of these studies indicated relatively low short-run elasticities, the long-run impact of price changes were estimated to be higher. Estimates of the short-run elasticity of total energy demand typically fall within a range of –0.13 to –0.26, with long-run elasticities in the range of –0.37 to -0.46. More targeted studies on residential electricity demand indicate ranges of between -0.158 to –1.1 in the short term and -0.2 to –1.1 in the long run.[17] These estimates suggest that, even at the bottom end of the ranges, there could be some scope to reduce energy consumption through the use of taxes.

These elasticity estimates, however, may not be directly applicable to Jersey and should therefore be treated with some caution. Demand response due to price changes is likely to be highly sensitive to individual economies, the composition of demand and the fuel mix employed. Notwithstanding these caveats, Oxera has used an assumed average demand elasticity of –0.3 to provide an indicative measure of the energy and carbon savings that could be achieved purely through the price effect of energy consumption taxes. Table 2.7 summarises the level of savings that might be obtained with tax rates designed to raise £1.4m per annum.

[15] The UK government assumes a social cost of carbon emission of £70 £/tC in 2000 terms within a range of 35 to 140 £/tC and rising by £1/tC per year. Source: HM Treasury (2002), "Estimating the social cost of carbon", January.

[16] For a summary of many of these studies see OECD (2006), "The political economy of environmentally related taxes", June.

[17] Ibid.

Table 2.7 Impact of energy taxes on demand and carbon emissions

Fuel	Tax rate (p/kWh)	Reduction in energy demand (GWh)	Reduction in emissions (tC)
Flat tax		**6.0**	**274**
Electricity	0.11	2.5	47
Gas	0.09	0.5	28
Heating oil	0.08	2.9	189
Coal	0.15	0.1	10
Carbon tax		**6.7**	**398**
Electricity	0.04	0.8	16
Gas	0.12	0.6	37
Heating oil	0.13	5.1	333
Coal	0.18	0.1	11

Source: Oxera calculations.

The greater targeting of taxes under the carbon tax option is likely to result in slightly higher levels of energy savings and a significantly higher level of carbon saving. However, in both cases the level of carbon saving achieved purely by the tax measure itself is relatively small when compared with the level of carbon savings expected from the spending package.

2.4.3 Distributional impacts of consumption taxes

The introduction of energy consumption taxes has the potential to have a disproportionate impact on different sectors on the economy and across different income groups. At a high level, applying a broad-based tax to all energy users would have a similar impact on both the domestic sector and the industrial and government sector due to the similar level and structure of energy demand for these sectors. However, within each of these sectors there is potential for significant distributional impacts. While it might be possible to mitigate some these impacts through exemptions for certain consumer groups, such exemptions would increase the tax burden on the rest of the economy and potentially undermine the effectiveness and efficiency of the tax regime in providing environmental benefits.

Data from the States of Jersey's 1998 input/output tables suggests that the two industrial sectors with the greatest overall energy use are: wholesale and retail trade; and hotel, restaurant and catering. However, as Table 2.8 shows, other sectors have a higher energy spend as a proportion of the their gross value added (GVA), with agriculture and fishing being the most energy-intensive non-public sector group.

Table 2.8 Economic sectors with highest energy intensity (1998)

	Spend on energy (£m)	Energy costs as a proportion of GVA (%)
Public services	1.5	11.1
Water	0.6	9.1
Agriculture and fishing	2.0	6.9
Manufacturing	2.6	6.0
Recreation, culture and sport	1.3	4.8
Sea and air transport and transport support	2.5	4.5
Hotels, restaurants and catering	5.7	3.8
Health, social work and housing	3.3	2.8
Wholesale and retail trade	5.9	2.2

Source: States of Jersey.

Jersey's main export—international financial services—has a very low energy input as a proportion of GVA, in the order of less than 0.03% for banks and building societies. Energy costs are also a small proportion of direct costs of international financial services—in the order of less than 0.5%. However, tourism, the other main export industry, is more energy-intensive, with direct energy costs approaching 5% of total costs in 1998. These relationships suggest that a flat tax rate of 1.3% on energy prices would translate into an increase in costs to the financial services sector of less than 0.007%, and 0.07% for the tourism sector. Under the carbon tax approach, there would be an even greater differential impact, as the financial services sector's direct energy use is almost entirely electricity-based, while the tourism sector is more reliant on oil, with around 25% of its direct energy supplies represented by oil. In either case there is significant potential for the direct costs on energy taxes to be more than offset by the energy savings if businesses participate in the energy efficiency programme.

For domestic consumers, energy taxes would have the greatest proportional impact on low-income households, which on average spend a higher proportion of their income on energy. Table 2.9, shows the average weekly household spend on energy in Jersey by income quintile, and the increase in spend that would occur under both tax options discussed above. Table 2.10 presents similar information but expressed as a percentage of total household income.

Table 2.9 Impact of energy taxes on household energy expenditure

	Income quintile					
Fuel	**1**	**2**	**3**	**4**	**5**	**Average**
Current spend on energy (£/week)	11.4	10.2	15.2	21.1	30.1	17.6
Flat tax						
Cost of tax (£/week)	0.24	0.22	0.34	0.47	0.74	0.40
Increase in energy costs (%)	2.1	2.1	2.2	2.2	2.5	2.3
Carbon tax						
Cost of tax (£/week)	0.22	0.19	0.33	0.47	0.89	0.42
Increase in energy costs (%)	1.9	1.9	2.1	2.2	3.0	2.4

Source: Oxera calculations based on Jersey Household Expenditure Survey 2005.

Table 2.10 Proportion of household income spent on energy (%)

	Income quintile					
Fuel	**1**	**2**	**3**	**4**	**5**	**Average**
Current spend	4.1	2.7	2.6	2.5	2.0	2.5
Tax based on social cost of carbon	4.2	2.7	2.6	2.5	2.1	2.6
Tax based on cost equalisation	4.2	2.7	2.6	2.5	2.1	2.6

Note: Average income levels in each quintile were estimated from the total expenditure.
Source: Oxera calculations based on Jersey Household Expenditure Survey 2005.

These tables indicate that energy consumption is generally regressive, falling as a proportion of income with increasing levels of income, although the absolute amount spent on energy tends to rise as income levels rise. Under either the flat tax or carbon tax options, the impact on households of raising £1.4m per year would be relatively small, starting at 22–24p per week for the low-income households, and rising to 74–89p per week in the highest-income quintile. This would represent a 1.3–3% increase in energy bills. Both tax options have similar distributional effects, although the carbon tax would be slightly more progressive due to the higher proportion of heating oil consumed by high-income households. This is likely to reflect the fact that oil (or even gas) central heating is more common in these quintiles, while electric heating is more common in the lower quintiles.

Table 2.10 shows that the average proportion of income spent on energy still remains relatively small, even for low-income groups. However, although the average impact of the tax on household bills is limited, and has a progressive nature (in terms of expenditure on energy), there could still be some distributional impact *within* the income groups, particularly if the carbon tax option is employed. If the energy taxes are more targeted towards oil and coal consumption, there will be a greater impact on households relying more on these fuels. While, on average, lower-income households rely more on electric heating, Oxera estimates that around 1,500 low-income households are heated with oil. The impact of carbon taxes on these households is likely to be more than twice the average impact for this income quintile. Despite this, the relatively low proportion of household income spent on energy suggests that the introduction of energy taxes at the levels envisaged in this analysis would be unlikely to have a significant impact on the incidence of fuel poverty on Jersey.[18]

2.5 Combining taxes and spending

Because the price elasticity of demand for fuel is low, and there appear to be quite significant barriers to householders taking up energy efficiency measures that appear economically rational, an approach to either fuel switching or increasing fuel efficiency, based solely on fiscal measures, is unlikely to be effective. Householders are also likely to require information and education about what is available, what advantages it would bring to them and how to practically go about achieving the increased efficiency. The EEC scheme in the UK is an example of where this approach is being tested.

Such schemes come with a cost, which has to be funded. If funded from the sale of fuel, this is equivalent to a hypothecated tax. The beneficiaries of the tax are those consumers who engage with the offer of information, help and/or subsidised energy efficiency measures. When implemented in this form there is a distributional effect over and above the pure fiscal effect of any tax (or its equivalent). This impact comes from the timing effect of the intervention and the fact that not all consumers may take up the offer, or be capable of taking

[18] Although there is no formal definition for fuel poverty in Jersey, the UK government defines fuel-poor households as those that need to spend more than 10% of household income to remain adequately heated.

up the offer, if their dwelling is unsuitable for the subsidised measure. All consumers of the taxed product pay for the advice, help, etc, but only those who take up the offer benefit. In turn, those taking up the offer may well be influenced by who is targeted by the agency supplying the help and information. By targeting low-income groups for the benefits of intervention, the negative distributional consequences of the tax can be at least partially mitigated.

3 Waste

3.1 Environmental objective

The States of Jersey Solid Waste Strategy sets out a vision for changing the community's attitudes towards waste. The vision encompasses an objective to minimise waste production, and responsibly manage the waste that cannot be avoided in a way that minimises the impact it has on the environment and health of the community. Consistent with these broad goals, several specific objectives have been identified.

– Reducing the amount of non-inert waste going into the energy from waste (EfW) station. The current EfW plant is old and polluting, and each tonne of waste sent to this plant releases harmful gases into the atmosphere. Furthermore, only 80% of the mass of waste entering the facility is burnt off—the remaining 20% (ash and unburnable material) is in turn sent to landfill. Although the EfW plant is due to be replaced, the reduction in waste sent to the plant remains an important goal, since there is limited capacity at the EfW and landfill sites, as well as a net cost of £30–£35 per tonne of burning the waste.[19]

– Increasing the level of participation in recycling programmes and overall recycling tonnage, and widening the range of types of material recycled.

– Reducing the amount of inert waste going to landfill in order to extend the lifetime of the existing site.

Although there are no specific targets on the desired level of waste reduction, under current levels of waste arisings, there is expected to be a five-year gap between the completion of the current landfill site and the availability of an alternative site.[20] An important objective, therefore, will be to slow down the rate of infill at the current site.

More specific targets are provided in the Solid Waste Strategy as regards recycling levels. The overall aim is to increase recycling and composting levels to 32% of all waste arisings by 2009. Contained within this goal are specific recycling rate targets for different material, as set out in Table 3.1.

[19] Source: States of Jersey.

[20] Source: States of Jersey Environment and Planning Department.

Table 3.1 Target recycling rates (%)

Material	Target recycling rate
Paper and cardboard	50
Glass	90
Metal	85
Plastics	10
Timber	50
Green waste	90
Electrical equipment	60
Inert waste	30

Source: States of Jersey (2005), 'Solid Waste Strategy', May.

There is a certain amount of interaction between these objectives, with increased recycling being one of the mechanisms for reducing the amount of waste sent to the EfW site, and limiting the volume of waste incineration resulting in lower volumes of ash being sent to landfill. Despite these interactions, it is clear that other mechanisms will need to be brought forward to lead to reductions in overall waste arisings.

Within the Solid Waste Strategy, the main spending programmes related to these objectives focus primarily on increasing recycling rates, through the expansion of the existing bring bank scheme and the introduction of kerbside sorting or co-mingled collection. In addition to the direct costs of these programmes, the recycling levels envisaged by the waste strategy will result in increased processing costs and capital expenditure of approximately £5.3m in order to provide a new 'Reuse and Recycle' centre and composting facility.[21] This analysis has not explicitly considered the use of environmental taxes to fund this capital programme, focusing instead on the potential for charges on waste disposal to contribute to the waste reduction costs and to cover the operational costs of the proposed recycling programme.

3.1.1 Background context

Currently, the 12 parish authorities are responsible for the collection of municipal waste, which they do on a weekly basis for general waste, and fortnightly or monthly for glass.[22] Household waste is currently sent in the first instance to the EfW plant at Bellozanne. The ash from this plant, along with other inert waste mainly from the construction industry, is sent to the landfill site at La Collette.

Under conditions of the contract of its sale from the Parish of St Helier to the whole Island (the covenant), the Bellozanne plant is obliged to accept refuse free of charge to residents of the parish of St Helier.[23] The presence of this covenant limits the economic instruments that could be used to aid the effective implementation of the waste strategy. However, as there has been some discussion that the covenant could be relaxed, this analysis has assumed that waste disposal charges could be levied on Bellozanne.

Currently, Jersey produces 330,000 tonnes of solid waste per year, which is broken down into various types as shown in Table 3.2.

[21] Source: States of Jersey (2005), 'Solid Waste Strategy', May.
[22] Glass collection in St Helier is managed through bring banks.
[23] As the covenant makes no distinction between commercial and residential waste, it is assumed that this arrangement applies to all waste arisings in the parish.

Table 3.2 Breakdown and destination of Jersey waste arisings

Type	Tonnage	Current destination
Green waste	12,500	Composted
Cans, paper, glass, timber and other recyclable	9,739	Recycled
Inert waste from construction	230,087	Landfill
Household, clinical and sewage treatment arisings	76,540	EfW, then 16,331 tonnes ash to landfill
Hazardous	471	Exported to UK

Source: Jersey Solid Waste Strategy.

3.2 Spending packages to achieve goals

As discussed previously, the main spending requirements identified within the Solid Waste Strategy relate to increasing recycling rates through expanding the bring bank system and potentially introducing kerbside recycling collection. The Solid Waste Strategy also envisages that, in addition to the costs of these collection programmes, additional funding will be required to cover the increase in processing costs that would result from meeting the recycling targets.

3.2.1 Expansion of the bring bank recycling scheme

Jersey currently employs a bring bank system for the recycling of materials. Bring bank systems are one of the simplest (for the operator) forms of recycling and as such are relatively cost-effective when compared with kerbside or co-mingled recycling. The main weaknesses of such a scheme are that it is incumbent on residents to take their waste to the sites (as opposed to leaving it outside their homes, as with a kerbside system), and the fact that the alternative to recycling is currently free at the point of disposal.

Another key problem identified in the Solid Waste Strategy was the lack of a location with facilities for accepting recyclable material. For example there are many places that accept aluminium cans, but few that accept cardboard. The success of a bring bank scheme is to a large extent dependent on the convenience of the disposal options to residents. In the UK, a study of public attitudes found that 43% of the population who did not recycle aluminium cans said that the distance to a facility or lack of a facility were the major reasons for this.[24] Therefore, a key goal identified by the waste strategy is to increase the number and range of bring banks, and their placement in convenient places such as supermarket car parks.

Since a car parking space has a value to the supermarket that would be lost if a bring bank were placed there instead, increasing the scope of the system typically carries a cost. In future developments, the provision of new recycling facilities is required by Jersey planning law; the cost of this space is therefore borne by the developer. However, land costs for facilities at existing developments are still an issue.

Land rent is only one of the costs associated with a bring bank scheme. To be effective, the contents of the Island bring banks must be regularly collected and processed. Increasing the number of facilities will necessarily incur more costs of collection and processing. However, this increase is not directly proportional, since new locations can be combined into existing vehicle collection routes, which will only marginally increase transport and driver wage costs. The Solid Waste Strategy estimates that £150,000 per annum would be required to fund the proposed bring bank network.

[24] Defra (2001), 'Survey of Public Attitudes to Quality of Life and to the Environment'.

3.2.2 Kerbside collection

Although expanding the current bring bank network is likely to increase recycling levels, it may be difficult to achieve the stated recycling targets through this system alone. Instead it may be necessary to introduce a different form of collection for recyclable material, either instead of, or in conjunction with, the bring bank network.

The most convenient methods of recycling from the public's perspective is kerbside collection, where households put their recyclable materials into separate containers and these are either sorted directly into the collection vehicle or co-mingled and sorted at a recycling facility.

The costs of kerbside collection depend on a number of factors, including population density, vehicle availability, and the range of materials collected. Estimates of costs from the UK vary between £7.50 and £20 per household per year, the average being £11.50. The average net cost, after the sales from recycled materials have been taken in to account, was £9.[25] It is assumed that the gross benefits from a scheme in Jersey would be negated by the high costs of transporting recyclable materials off the Island, and therefore the average net cost per household would be higher—possibly considerably higher—than in the UK.

A kerbside collection system for glass currently exists on Jersey (outside St Helier); a kerbside scheme for collecting paper and metals is currently being tested in St John's. The limited material scope, as well as the discounted price currently offered by the contractor (approximately £2.40 per household per year), mean that costs from these scheme are likely to be much lower than a full long-term kerbside collection system.

Taking all factors into account, estimates from the Environment and Planning Department suggest that the collection costs for a full kerbside collection system in Jersey would be approximately £450,000 per annum. In addition to these collection costs, any increase in recycling levels is likely to result in higher costs for processing the recycled materials.

3.2.3 Additional processing costs

Different materials have a range of values as commodities once recycled, depending on their final function. Clothing, once collected, is given to the Salvation Army and taken to the UK; it therefore contributes nothing to the economy once disposed of. Timber from the construction and demolition industry, however, can be reused as kindling or in new-build projects, and is worth approximately £14/tonne. However, the costs of collection and processing the timber are still greater than their sale value, and represent a loss to the economy of £121–£171 per tonne. In addition, the majority of materials exported from Jersey for recycling require subsidies, since the value to the recycler is typically less than the handling and shipping costs. As a result, any increase in recycling levels on Jersey is likely to result in additional processing costs. An estimate of these additional costs is provided in Table 3.3, suggesting that the processing costs associated with the 32% target would be around £485,000 higher than currently.

[25] Source: States of Jersey Environment and Planning Department.

Table 3.3 Waste processing costs consistent with Jersey's stated policy goals

Material	2006 level of recycling (tonnes)	Cost of recycling £/tonne	2008 target (tonnes)	Increased cost of meeting target (£)	2015 target (tonnes)	Increased cost of meeting target (£)
Paper	5,228	36	7,000	62,908	9,000	133,910
Metal	216	110	500	31,240	1,000	86,240
Plastics	463	205	600	28,085	700	48,585
Timber	1,500	138	2,000	69,009	2,300	110,415
Electronics	100	265	300	53,000	500	106,000
Glass[1]	5,487	n/a	6,000	n/a	8,000	n/a
Organics[1]	12,500	n/a	13,800	n/a	15,800	n/a
Total	25,494		30,200	244,242	37,300	485,150

Note: [1] Glass and Organics are processed on-Island and the costs are included within the existing waste budget.
Source: Jersey Solid Waste Strategy, estimates from the Environment and Planning Department and Oxera calculations.

The Solid Waste Strategy indicates that some of this additional processing cost can be absorbed within the existing waste budget; however, there would still be a requirement for additional funding in the order of £300,000 per annum.

3.3 Taxes and waste disposal charges

The previous section indicated that additional funding of up to £900,000 per annum would be required in order to meet the recycling objectives set out in the Solid Waste Strategy.[26] The primary mechanism that has been suggested for raising this revenue is the introduction of charges on the disposal of non-recycled waste. It is also hoped that such a charge might provide additional incentives to either increase recycling rates or reduce the overall level of waste generated. In addition, it has been suggested that taxes on packaging and plastic bags could be used as means to limit the use of these products.

3.3.1 Charges for waste disposal

Currently, Jersey does not charge directly for the use of the Bellozanne EfW plant, but it does charge £3.60 per tonne for recyclable waste and £10.00 for non-recyclable waste delivered directly to La Colette (the landfill/land reclamation site). Like all goods and services, there is a relationship that exists between the price of waste disposal and the demand for it. If the price of disposing of waste is increased, there *may* be less waste being sent for disposal (whether to land fill or to the EfW plant). If creators of the waste can reduce the amount they have to pay for disposal by reducing the amount of waste they create, or if they can reduce their own payments by treating their waste differently (for example, by taking out the recyclable material), a financial incentive is created to change their behaviour. The current charges at La Colette provide such an incentive for inert waste; however, at present there is no mechanism for incentivising reductions in the level of non-inert waste being sent to Bellozanne.

For such incentives to work, there needs to be a direct relationship between the level of waste produced by individual Jersey households and business and the waste disposal

[26] This is made up of £150,000 to expand the bring bank network; £450,000 to fund kerbside collection; and £300,000 to cover the additional processing costs.

charges they face. Such a relationship could be created directly, in the form of end-user disposal charges, or indirectly through the parishes.

While potentially difficult to administer, direct waste disposal charges could be applied by requiring all waste to be disposed of in approved bags, with the levies on these bags being used to fund the recycling programme.

An alternative mechanism would be to introduce gate fees for waste disposal at Bellozanne. While in the first instance it would be the parishes that would incur the costs of these gate fees, this would provide an incentive for them to reduce levels of household and commercial waste arisings. One mechanism they could use to achieve this would be to directly pass these costs through to parishioners in the form of direct waste collection charges.

Regardless of the mechanism by which the waste disposal charges are applied, the level of charging needed to fund the £900,000 required by the recycling programme would be approximately £11.8/tonne of total non-inert waste produced. The impact of these charges on the cost of municipal waste disposal would equate to around £15 per household per annum.[27] For the commercial and industrial sector, the total cost of the charges would be around £375,000 per annum.

3.3.2 Impact of disposal costs on waste arisings

The reduction in volume of waste being sent to landfill or an EfW plant stemming from a rise in the price of its use (either because charges or a tax is introduced) depends on the market price elasticity of landfill/EfW use and users being explicitly faced with the costs. Studies in the UK (and elsewhere) have shown that landfill use is generally quite inelastic—ie, quantity decreases little compared with an increase in price, since there is often still no cheaper disposal alternative. If the use of landfill/EfW is to be reduced via a tax, the tax rates have to be sufficiently high for recycling to have a comparable cost to users.

For Jersey, where the EfW plant is the equivalent of landfill disposal, this suggests that any charges (including additional taxes) on EfW use will not be effective in significantly decreasing the total waste volumes that need to be disposed of. More realistically, if residents are faced with the direct costs of using the EfW, they may be more inclined to divert waste to recycling, where this is possible and where this represents a lower-cost option *for them.*

Even without direct charging of residents, it is still possible that charging parishes for waste disposal at the EfW plant can provide them with a financial incentive to encourage recycling. Currently, the costs of recycling schemes are such that there is a large disincentive to expand them. If these costs were offset by a reduction in disposal costs for the EfW facility, they would become more attractive for parishes.

3.3.3 Introduction of taxes on packaging and plastic bags

A typical family disposes of 3–4kg of food packing in a week, accounting for 15% of household waste overall.[28] Although this makes up a small proportion of the material being sent to Bellozanne (less than 10%), there may be scope to reduce this volume. Levying a packaging tax on supermarkets could incentivise them to reduce the volume of packing on their products.

Plastic bags cause special harmful externalities if not disposed of carefully, being especially visible when discarded in public and harmful to wildlife. Introducing a tax on plastic bags could dramatically reduce the use of them.

[27] Based on the 44,406 tonnes of waste sent to Bellozanne by the parishes in 2004.

[28] INCPEN website,' What You Need to Know about Packaging and Waste'.

However, the benefits of such a tax may not be as great as they first appear. Packaging is a cost to the producer and retailer, and as such it is already economically beneficial for them to reduce to a minimum the gross amount of packing, while securing the benefits that packaging bring to either the retailer (eg, reduction in spoilage), or the consumer (eg, increased ease of transport, reduction in spoilage). Imposing a small tax would therefore be unlikely to significantly reduce the amount of packaging waste produced, since it would be unlikely to shift the optimal trade-off point between packaging costs and benefits to any great extent. In addition, although a packaging tax would generate a stream of revenue for the Treasury, the supermarkets and shops are likely to pass the costs directly to customers. Since food purchasing increases relatively little with income,[29] a food packaging tax represents a regressive tax on households, rather than a tax on business.

Finally, reducing packaging may not be equivalent to reducing waste overall. The packaging industry council argues that packaging keeps food fresh and therefore reduces food waste, and that a decrease in packaging may even lead to an increase in the overall level of household waste.[30]

Although the impact of a tax on packaging may not have a very significant effect on the total amount of packaging waste arising, there may be conditions under which very specific taxes can achieve a particular objective. Although there does not appear to be a definitive analysis of the impact of the Irish plastic shopping bag tax, there does seem to have been a significant reduction in the consumption of plastic carrier/shopping bags, and a reduction in the *litter* associated with their (improper) disposal.[31] Similar impacts may also have occurred in other jurisdictions where supermarkets have agreed not to give away free shopping bags at the checkout (eg, Corsica). The impact of a highly targeted packaging tax may not, however, be a good indication of the impact of a general packaging tax. In particular, there are very close substitutes for the free plastic carrier/shopping bags that are handed out by retailers, especially strong paper bags, multi-use (and much stronger) plastic bags, shopping bags made of cloth, etc. In economics terms the existence of very close substitutes that are not taxed is likely to create a larger price elasticity of demand. Under these circumstances, a relatively small tax can induce significant changes in behaviour, as consumption switches to the untaxed close substitute (and, as a side effect, significantly reduces the revenue-raising potential of the tax).

In addition, targeting the tax at a very specific problem—for example, the litter associated with the improper disposal of shopping/carrier bags—can mean that the tax is successful even if it has a very limited (or even no) impact on the total waste arising. In the UK, all plastic bags make up only 0.3% of the domestic waste stream. If the same proportion applies in Jersey, this is clearly only a very small amount of waste arising, and therefore the scope for reduction of household waste through a shopping/carrier bag tax is minimal. Furthermore, as indicated above, there may be other non-tax ways to achieve the same objectives—for example, an agreement by supermarkets on the Island not to provide any plastic carrier bags.

3.4 Distributional impacts of waste taxation and charging

If a policy of per-tonne charging for the EfW facility were introduced, the majority of these charges would naturally fall on the parishes. The actual level of this cost would clearly depend on the level of gate fees applied; however, a broad indication of the impact on parishes can be provided based on the average waste processing costs at Bellozanne of

[29] Jersey Household Expenditure Survey, 2005.
[30] INCPEN website, 'Packaging: The Facts'.
[31] OECD (2006), 'The Political Economy of Environmentally Related Taxes', June.

around £32 per tonne.[32] With 44,500 tonnes delivered to Bellozanne from parishes in 2004, the increase in total parish costs would be in the order of £1.4m, which would need to be recovered from residents or commerce. (Note that there is a matching reduction in net expenditure of £1.4m by the States.) Households account for around half of the municipal waste arisings; therefore, if these costs were passed through to residents, the average impact of applying these gate fees would be approximately £20 per household per year.[33] Clearly, higher gate fees aimed at reducing waste arisings would result in proportionately higher costs to the parishes (and hence households).

The precise distributional impacts of these increased costs would depend on how the parishes would choose to recover them. If they are recovered through increases in parish rates, the impact will be slightly regressive when measured as a proportion of total household expenditure (although the absolute amount paid by households would increase as household income increased). Parish rates currently represent a declining proportion of total expenditure from around 1% in the lowest household income quintile to around 0.6% in the highest quintile.[34] The present funding mechanism, which is dominated by income tax, is significantly progressive, with lower-income households paying a significantly lower proportion of their income in taxes than higher-income households.

If parishes recharged the costs (charges or taxes) back to households on the basis of the amount of waste generated by each household (eg, by introducing per-bag charging), the distribution would again be different. More waste is likely to be produced by households with more disposable income. If waste production was proportional to waste-producing expenditure (ie, excluding expenditure on services, transport, housing, etc) the ratio of expenditure between the lowest and highest quintiles is approximately 1:5, and this would be reflected in the charges paid by households. (If charges are based on rates, the ratio is more like 1:3.) However, there does not appear to be any extensive empirical data on the relationship between household income and the production of waste, and a proportionate relationship may not hold.[35] For example, expenditure on higher-priced items as income rises would not necessarily produce more waste with increasing income.

Charges falling on commercial enterprises are likely to feed through into prices. There is insufficient data available to calculate the relative impact but, in general, activities producing more waste per unit of output would see their prices rise more in absolute terms than other activities. As a first approximation, these increases in the costs of production will hit residents in proportion to their expenditure.

Creating the financial incentives through charges or taxes for those generating waste to either reduce that waste or to take action to reduce particular forms of waste (eg, to sort waste such that it can be more easily recycled) will change the distribution of the recovery of the costs of waste disposal. Given that the current cost recovery is based on a progressive tax structure, it is likely that any new charging structure would be less progressive. In the future, with the introduction of GST, the difference between the charging structures is likely to be (slightly) reduced.

3.4.1 Increasing gate fees at La Colette

It is currently anticipated that all available capacity at La Colette will be depleted by 2015[36].This may present a problem if an alternative site cannot be found in time. It is

[32] This is based on 2004 data from the Solid Waste Strategy, indicating total throughput of around 77,000 tonnes and net running costs of approximately £2.5m.

[33] Assuming 35,000 households. Sources: States of Jersey (2005), 'Solid Waste Strategy', May, pp. 24, 25; States of Jersey (2005), 'Jersey in Figures', p. 32; and States of Jersey, 2006 Budget, p. 37.

[34] Jersey Household Expenditure Survey, 2005, expenditure by income quintile, detailed spreadsheet.

[35] Dresner, S. and Ekins, P. (2004), 'Charging for Domestic Waste: Combining Environment and Equity Considerations', PSI Research Discussion Paper 20, available at: http://www.psi.org.uk/docs/rdp/rdp20-dresner-ekins-waste.pdf

[36] Source: States of Jersey Solid Waste Strategy 2005.

currently believed that there may be a gap of up to five years before the intended replacement will be available. It would be therefore advantageous to reduce inert arisings and extend the lifetime of the site.

Increasing the £10/tonne gate fee on non-recyclable inert waste could have the effect of reducing the inert waste arisings. However, since most of the inert waste is produced by the construction industry, if the fee is to have an impact it will need to create an economic incentive to:

- increase the incidence of recycling the material on site;
- change the economics of refurbishment versus rebuilding; or
- change the economics of (re-)development to reduce the level of activity in the construction sector.

The construction of new buildings often requires the use of inert material such as aggregates. These aggregates can often be created on-site as part of the demolition process and, even in the absence of a tax, there can be economic benefits from recycling material with the building site. The application of a landfill tax (or increased gate fees) will improve the economics of recycling. However, the precise impact on the economics, and hence the impact on the recycling rate, will depend on site-specific characteristics. Thus the precise impact of any particular tax level is difficult to predict, and is beyond the scope of this report.

However, one approach would be to set a tax rate that made the current costs of disposal similar to the costs that would apply if La Colette was full and the new facility was unavailable.[37] This shadow price would ensure that recycling that was economic in the future takes place now, which would help to avoid the actual costs to the economy that would be incurred by extending the life of (the lower-cost) La Colette. The tax revenue created represents a transfer in the economy, while if the costs of the more expensive disposal are actually incurred, this spending is lost to the economy.[38]

As disposal costs are likely to represent a relatively small part of the total costs of construction, actually altering significantly the economics of refurbishment and (re)development is likely to require quite substantial taxes. As, by definition, these taxes would change the built form in Jersey, the knock-on effects on the economy could be significant, and very careful consideration would need to given to the costs of this approach compared with the environmental benefits of reduced inert waste disposal.

In purely economic terms, the price at La Colette required to reduce inert waste arisings sufficiently to extend the life of the site for five years depends on the price elasticity of demand. Assuming a relatively simple and inelastic market, modelling indicates that the price may need to increase to at least £22/tonne in order to preserve enough void to prolong the site life by five years.[39] However, for the reasons set out above, the precise economics of on-site recycling should be analysed before any tax rate is set.

3.4.2 Comparison of waste charges in other countries

In the UK, landfill sites are largely privately owned and charge a gate fee to both trade and council waste disposal authority customers. For trade waste, this fee ranged from £7/tonne to £40/tonne in 2003,[40] depending on waste and contract types. Municipal contracts for disposal of household waste are re-tendered after a number of years (depending on council) and bid for competitively by a number of waste disposal operators.

[37] Such rates could be derived by estimating the future costs of the replacement facility and applying these to waste deliveries at La Collette.

[38] Ideally, the tax rate would be set just at the level at which the use of La Colette is reduced so that its life is extended just until the new facility can come onstream, or to raise the current price to the cost of the interim solution, whichever is the lowest.

[39] Source: Oxera.

[40] Source: Environment Agency.

In other countries, the charge for waste works in different ways. The Jersey Solid Waste Strategy document cites the examples of Switzerland and Ireland, where official bags and tags for waste are sold, and only waste disposed of using these is collected.

Many countries in Europe charge for waste disposal via a gate fee regime. Table 3.4 compares the nature and level of these charges.

Table 3.4 Comparison of EU landfill taxes and charges

Country	Waste levy
Austria	Ranges from €7/tonne to €123/tonne
Czech Republic	Up to €15.68/person/year
Denmark	Municipal: €184.92 average annual household charge. Trade waste €44–€50/tonne
Estonia	€0.12–€12.78/tonne
Finland	€30–€50/tonne
France	Varies regionally
Greece	Not available
Hungary	€12.09–€23.34/tonne.
Italy	€0.21–€25/tonne
Latvia	€5–€8/m^3
Lithuania	€3,20–€6,57/m_3
Malta	€0.77/tonne
Netherlands	€185 average annual household charge
Poland	€2–€30/tonne
Sweden	€31/tonne trade, municipal varies regionally
United Kingdom	€2.92 inert, €26 standard waste

Source: OECD economic instruments database.

Costs of recycling the waste, once collected, vary depending on the level of sorting undertaken at the kerbside, with co-mingled being more expensive to process than fully sorted waste. To reflect this cost disparity, and to encourage parishes to implement kerbside-sorted waste, different fees for these types of waste could be introduced. The differential in this fee would depend on the estimated costs of implementation of the recycling regime.

3.4.3 Would there be a rise in fly-tipping?

The financial incentive to reduce waste production through charging for the amount of waste produced has the unwelcome side effect of also creating a financial incentive to avoid these payments by fly-tipping. No estimates appear to exist yet on the precise relationship between direct disposal charges and levels of fly-tipping, therefore placing a value of the clean-up charges incurred by Jersey would be highly error-prone.

However, in the UK, recent studies have shown that fly-tipping is a significant problem, with an average of 1.8 incidents per thousand population every month. This leads to a cleanup bill for the local authorities of somewhere in the region of £50m annually[41]. This represents a cost of about £1 per person per year, so on a strictly proportionate basis the costs in Jersey would be around £80,000 per year. A majority of this waste tipped illegally was black-bag and other household refuse.

[41] http://www.defra.gov.uk/environment/localenv/flytipping/pdf/flycapture-data0506.pdf

3.5 Financing recycling and waste disposal

The economics of waste disposal using an EfW facility and recycling on an island such as Jersey raises the possibility that increases in recycling will increase the total costs of waste disposal faced by Jersey residents. The additional costs incurred by the extra recycling will need to be recovered from Jersey residents in one way or another.

As the success of recycling requires the cooperation of householders to sort their waste and possibly to transport the waste to bring banks, it is unlikely that this recycling cost can be recovered from those participating in the recycling system. Indeed, to encourage householders to participate in recycling schemes, the financial incentives should, if possible, flow in the other direction, notwithstanding the fact that the direct economic costs of disposal may be working in the opposite direction. The justification for this is that the environmental (or other) benefits arising from the additional recycling provide benefits to Jersey that outweigh these additional costs.

The main options for the funding of the recycling schemes are from general taxation or from a tax on the disposal of non-recyclable waste. Charges on non-recyclable waste may, or may not, be passed on to residents in a way that allows them to alter their costs through changing their own level of recycling. These charging structures have different distributional impacts, as well as providing different financial motivations for residents to change their behaviour in desired (or undesirable) ways.

Given the existing main tax structures that exist in Jersey, using general taxation to fund recycling schemes is likely to have the most progressive outcome, but creates no financial incentives for residents to increase recycling. If residents are charged directly for the disposal of non-recyclable waste (including any tax to pay for recycling)—for example, by the bag or by weight of waste taken away—and recycling is free, the maximum financial motivation to recycle is created, as is the motivation to fly-tip. Although the total paid to dispose of waste is likely to increase with income in absolute terms, it is also likely to decrease with income as a proportion of that income.

In the intermediate position where parishes are charged by weight or volume for disposal of non-recyclable waste (including the tax), but this is not reflected in the charging structure facing households, no additional financial motivation is provided to the householder to recycle, but there will be a motivation for parishes to encourage recycling. This approach is likely to produce a less progressive outcome than using general taxation, and it is also possible that this outcome is less progressive than linking the charges to volume of waste produced by households.

The administrative costs of the different charging schemes should also be taken into account. The systems for both the parish rates and income tax are already in place. Charging residents by bag or weight would require a new infrastructure, as would, to a more limited extent, gate fees at the EfW plant.

4 Transport

Background

By international standards, Jersey has a high level of car ownership, with 1.42 cars per household.[42] In 2004, the highest concentration of cars in the EU 25 was in Luxembourg with 650 motor cars per 1,000 inhabitants.[43] The corresponding figure for Jersey was significantly higher at more than 800 cars per 1,000 inhabitants.[44] Between 1995 and 2005, the total number of vehicles registered in Jersey grew, on average, by 2.7% per annum and, since 2000, annualised growth has been around 2%.[45] In comparison, in the EU 15, the number of passenger cars rose by around 2% per annum between 1995 and 2004.[46] In the UK, the key driver of personal travel patterns over the past two decades, resulting in increasing car ownership and use, have been income growth and the declining real cost of car ownership.[47] These factors may also have been important drivers of car ownership and usage in Jersey. The resulting increases in traffic are likely to have produced greater congestion and a deterioration in the local air quality in Jersey during peak traffic times.

Objectives

The 'Strategic Plan 2005–2010 Update' outlines the aim to 'to develop an integrated transport strategy that shifts behaviour and cultural mindset with regard to car ownership usage'. The 'Integrated Travel and Transport Plan for Jersey' identifies the following key objectives to be achieved by 2011:

– **a reduction in peak hour traffic**—the plan sets as a target a reduction in peak-time traffic of 15% compared with current levels;[48]
– **an improvement in local air quality**—the plan sets a target of zero in the number of times local air quality standards at monitored sites are not met (this currently occurs around seven times per year).

To achieve these objectives, a number of policy options are investigated in the Transport Plan, which can be broadly separated into spending and taxation measures.[49]

– **Spending**—spending measures can finance changes with positive externalities that make alternatives to (single occupancy) car use more attractive.[50] Measures include improving the frequency and quality of bus services to induce commuters to switch from cars to buses.

– **Tax**—taxes aim to alter behaviour by imposing a cost on activities with negative externalities. Examples include increasing the relative cost of travelling by car by increasing the cost of fuel or increasing parking fees.

[42] Source: Jersey Statistics Unit (2006), 'The Jersey Annual Social Survey 2005: Chapter 4 Travel and Transport'.
[43] European Commission Directorate-General for Energy and Transport (2006), 'Energy & Transport in Figures 2005'.
[44] Source: Jersey Statistics Unit (2006), 'Population Changes 2000 Onwards'; Jersey Statistics Unit (2006), 'Statistical Review 2002'; and Oxera calculations.
[45] Source: Jersey Statistics Unit (2006), 'Jersey Facts and Figures 2005'; Statistics Unit (2002), 'Statistical Review 2002'; and Oxera calculations.
[46] European Commission Directorate-General for Energy and Transport (2006), op. cit.
[47] Source: Transport for London (2004), 'The Demand for Public Transport: A Practical Guide'.
[48] The measures proposed are intended to achieve a gross reduction in peak traffic of 20% by 2011.
[49] Source: Jersey Statistics Unit (2006), 'Jersey Facts and Figures 2005'.
[50] Strictly speaking, spending measures could also make car travel less attractive—for example, by demolishing public car parks, or implementing traffic clamping measures.

The objectives outlined in the Transport Plan require car usage to be reduced during *peak hours* (to reduce congestion), rather than to reduce car usage per se. As such, an important requirement of policy is to change the behaviour of car users during peak hours. While there is only limited information on the profiles of traffic participants during peak hours, survey evidence shows that the largest group comprise people travelling to and from work. The Jersey Annual Social Survey shows that, on a weekday, around 50% of all car journeys are made for work purposes. Around 50% of people travelling to work usually do so by car, on their own.[51]

In general, and if successful, policies aimed at reducing (peak-time) congestion through modal switching will have a knock-on effect on emissions and can therefore lead to improvements in local air quality.

Proposed policies

The Transport Plan sets out a number of spending measures designed to alter car usage patterns, including the following.

– **Public transport improvements—**proposed measures include increases in the capacity and service quality of buses, and a reduction in emissions from buses.

– **Soft measures—**policies that encourage more cycling, walking, car sharing, tele-working and reductions in unnecessary car trips.

Under the proposed policies, most of the objectives are to be met through soft measures (approximately 13% of the 15% reduction in peak traffic). Section 4.2 briefly discusses the spending proposals. A detailed review of the costing and efficiency with which the proposed spending package will meet its environmental objectives are beyond the scope of this report. The estimates provided by the Transport Plan are therefore taken as given.

The cost of these policies is estimated in the Transport Plan to be £1.7m–£2.0m per year, and it is proposed that this is funded through the environmental taxation measures set out below. The revenue raised from the proposed annual Vehicle Emissions Duty (VED) is also proposed to fund general revenue expenditure of around £4m per annum, to replace the revenue currently raised by the Vehicle Registration Duty (VRD), which is being withdrawn on the introduction of GST.[52] In total, therefore, between £5.7m and £6m in revenue needs to be raised through environmental taxation relating to transport. The taxes being discussed are capable of raising substantially more than this. Given the cost of the spending policies proposed in the Transport Plan, the taxes could be set at a relatively low rate; alternatively, the revenue could be used to finance environmental spending programmes outside the Transport Plan.

At the levels of taxation needed to raise the required revenue, the impact on car usage of the taxes discussed in this section is likely to be limited, particularly during peak hours. As such, while there may be some impact on behaviour arising from the taxation measures, it is likely that most changes in car usage patterns would have to be induced through the spending polices.

Of the taxes discussed within the Transport Plan, the following options appear to be the most likely:

– annual VED;
– an increase in fuel duty;
– an increase in parking charges.

[51] Jersey Statistics Unit (2006), 'The Jersey Annual Social Survey 2005: Chapter 4 Travel and Transport'; and a survey undertaken for the Transport Plan.
[52] Source: Jersey Statistics Unit (2006),'Jersey Facts and Figures 2005', quoting Jersey Customs and Excise.

A further measure discussed in the Transport Plan was the possibility of introducing compulsory annual vehicle emission testing for all vehicles. This would provide a means of ensuring that the actual emissions of a vehicle comply with the manufacturer's published emissions levels. Such an approach could provide some benefits, particularly as a way of targeting emissions from older vehicles, or could be used in conjunction with a VED system as a means of setting the band for each vehicle. This latter approach could provide an economic incentive for car owners to maintain their vehicles in order to minimise emissions, although it could increase the administrative burden of a VED system.

4.1 Spending measures

4.1.1 Background

The success of transport spending policies in achieving their objectives tends to be determined by the details of implementation and local circumstances. Since the polices are not yet finalised, Oxera has not been able to assess the likely environmental impact, and the Transport Plan's estimates of the policies' impact on objectives are therefore taken as given. Oxera has not reviewed the efficiency of achieving the objectives or the cost implications of the Transport Plan as part of this analysis.

The main mechanism by which the spending measures translate into the reduction of peak-time traffic and improved air quality is transport modal switching. Journeys that would otherwise have taken place by car are substituted by journeys by bus, walking or cycling. These alternative modes of personal transport have substantially lower emissions per passenger-km (in the case of buses, as long as there are sufficient passengers). As a result, if the spending measures are successful in achieving a reduction in peak-time traffic, the objective of improving local air quality is also likely to be met as a by-product of the reduced car use.

The improvement in air quality may also be achieved by changing the emission characteristics of the cars in Jersey—eg, through the VED, which raises the price of high-emission cars, as discussed below.

4.1.2 Public transport

The Transport Plan suggests several measures to increase the capacity and quality of the bus service. Around 2% of the proposed real reduction in peak traffic is to be achieved through increased bus usage. To meet the Plan's objectives, the measures need to be targeted at increasing the capacity and quality (including access to bus stops and frequency of service) of buses during peak periods in order to encourage commuters to switch to the bus service.

The increase in spending on buses, including measures to reduce emissions, is subject to negotiation with the holders of the bus franchise.

The introduction of a priority bus lane (and high vehicle occupancy lane), as discussed in Transport Plan, could make bus use more attractive relative to single-occupancy cars, since it would reduce the bus journey time, particularly during peak times.

As indicated above, evaluating whether the proposed increase in bus capacity and quality is likely to reduce traffic during peak times would require more detailed survey work of current transport demand. However, evidence shows that around 36% of frequent car users (those travelling at least once per day) revealed that nothing could encourage them to use their car less. However, 39% stated that an improved bus service would encourage them to use the bus more, so there may be scope for a significant reduction in car usage in Jersey.[53] The objectives of the Transport Plan are not dependent on a significant modal switch from cars to buses.

4.1.3 Soft measures

An important component of the Transport Plan is the reduction in road traffic through soft measures—ie, initiatives that encourage more cycling, walking, car sharing, tele-working and reductions in unnecessary car trips. As highlighted above the Transport Plan proposes that the majority of the reduction in traffic during peak hours is to be achieved through these measures.

Research by the UK Department for Transport has shown that, nationally, such measures may, over the longer term, reduce traffic levels by 5% in the UK.[54] More recently, studies have suggested reductions of up to 11% may be achieved for the UK overall, and up to 20% during some urban peak periods, under intensive use of these soft measures and a supportive policy context.[55]

The effectiveness of such measures in changing individual travel patterns and in reducing peak traffic depends on the specific package adopted, and is linked to other spending measures such as the availability of safe cycling routes and increases in the supply and quality of bus services.

4.2 Taxation measures

As indicated above, three main taxation measures related to transport (VED, fuel duty and parking charges) are proposed options to pay for the spending programmes that underpin the achievement of the environmental objectives of reducing peak hour traffic and improving air quality. These are analysed in more detail below.

4.2.1 Vehicle Emissions Duty

4.2.2 Environmental impact

An annual VED imposes an annual tax related to vehicle CO_2 emissions. VED can be considered as increasing the (fixed) running costs of vehicles because once the car is purchased, the VED is a fixed annual cost that has to be paid regardless of other variables such as usage intensity.[56] For example, if the VED for a certain vehicle is £100 per year, and the vehicle is kept for five years, the total amount that will have to be paid for owning the car is a fixed £500 regardless of any change in driving habits. As such, a VED does not provide a marginal incentive to modify driving habits, and, as a result, the VED is therefore likely to have little impact on peak-time congestion, as it does not affect the marginal cost of vehicle use.

If the VED is to have an impact on peak-time vehicle use, this will have to be achieved through the mechanism of increasing the fixed costs of owning a car such that some potential owners of cars do not purchase a car at all or that, for some income groups, following a reduction in disposable income as a result of VED, they keep their expenditure on other goods and services fixed, and reduce their expenditure on car trips to balance their household budgets. However, these two effects are unlikely to produce a significant impact

[53] Jersey Statistics Unit (2006), 'Jersey Annual Social Survey 2005'.

[54] Halcrow Group Ltd (2001,2002), 'Multi-Modal Studies: Soft Factors Likely to Affect Travel Demand', report for Department for the Environment, Transport and the Regions.

[55] Sloman, L., Cairns, S. and Goodwin. P.B. (2004),'Smarter Choices: Changing the Way We Travel', Department for Transport.

[56] The price increase would not be proportional across all the types of vehicles since those that emit more would face a greater purchasing price increase.

as VED payments for the least polluting cars are likely to represent a very small proportion of the total car-ownership costs, and an even smaller proportion of total expenditure. It is also worth noting that, if the latter effect were significant, it would occur as a result of any tax increase or, indeed, a price rise in any of the other, more essential, expenditure.

However, through setting *differentiated* rates for low- and high-emission vehicles, a VED can be used to incentivise consumers to buy lower-emission cars. If purchasers respond to this incentive, over the longer term, a VED will change the emission characteristics of the vehicle stock in Jersey, thereby improving the local air quality. The likely impact of this mechanism depends on how responsive new car buyers in Jersey are to a change in the price differentials between different cars.[57]

UK experience

The UK VED, introduced in 2001, is an annual levy on vehicles based on graduated CO_2 emissions bandings, with vehicles registered prior to March 2001 being taxed at separate rates. For petrol cars, the UK system distinguishes between seven bandings of CO_2 emissions. Separate bandings exist for diesel cars; however, since more than three-quarters of cars in Jersey are petrol-powered, the focus in this section is on petrol cars. These bandings are shown with the corresponding rates in Table 4.1.

Table 4.1 UK VED figures

Band	CO_2 emissions figures (g/km)	VED rate for petrol cars (£/year)
A	Up to 100	0
B	101–120	40
C	121–150	100
D	151–165	125
E	166–185	150
F	185–225	190
G	Over 225	210

Source: House of Commons Environmental Audit Committee (2006), 'Reducing Carbon Emissions from Transport: Ninth Report of Session 2005–06', July.

While VED may be used as a policy tool to incentivise the purchase of low-emission cars, a recent report by the Environmental Audit Committee challenges the effectiveness of the current UK VED banding structure in achieving this.[58] The main conclusion is that the magnitude of the existing tax rates is not sufficiently large to influence buying behaviour, since the present tax rates do not 'hit people in the pocket'.[59] Instead of the current difference between the lowest and highest emission vehicle of around £240 pa, the committee recommends a £300 gap between each band (ie, £0 for the lowest emission band and £1,800 for the highest emission band).

The report recommends that the existing differentials in the VED between different categories of car are widened substantially. Such changes could be introduced at once on a

[57] Although the VED would be applied to all cars, its direct impact on the stock of used cars on the Island is likely to be rather small, if not negligible. This outcome arises because if the relative annual running cost of an existing 'dirty' vehicle rises, its value in the second-hand market is likely to fall. Thus the total annual running costs of a 'dirty' car will change less than the VED, so the VED is unlikely to change the mix of cars on the Island except through the impact on the new car market. Exceptions to this outcome could occur if the cost differentials of the VED were such that, as a result of the induced changes in the relative price of second-hand cars, it became economical to import 'clean' second-hand cars from outside Jersey and to export 'dirty' cars to some other jurisdiction (eg, the UK).
[58] House of Commons Environmental Audit Committee (2006), 'Reducing Carbon Emissions from Transport', Ninth Report of Session 2005–06, July.
[59] Department for Transport (2004), 'Assessing the Impact of Graduated Vehicle Excise Duty: Qualitative Report', March.

revenue-neutral basis, and would reward consumers for making greener choices as well as encouraging manufacturers to produce greener cars.

Hence the Committee's conclusion is that using a VED tax to significantly alter buyer behaviour would require larger differentials between different bands than are currently applied in the UK. However, introducing such large differentials as proposed by the Environmental Audit Committee raises some distributional issues, since purchasers of vehicles before the introduction of the new levy of VED would not be able to respond immediately to the increased tax burden by purchasing a low-emission car. Such concerns would need to be addressed prior to introducing such a measure.

However, unless the VED is introduced with a relatively large differential between low- and high-emission cars, it is likely to have little impact on emissions in Jersey. The main purpose of such a levy can therefore be seen as raising revenue hypothecated for other measures that are more effective at achieving environmental objectives.

4.2.3 Revenue-raising potential of a VED

The UK bandings, which do not appear to have had a significant impact on demand, can be used to calculate the potential revenue from a similar VED applied to Jersey, although it is necessary to make a number of assumptions.

– **Tax base**—the revenue is calculated only for motor cars in Jersey, which constituted approximately three-quarters (76,187) of the Island's total number of motorised vehicles in 2005 (101,583).[60] Because the VED would also be levied on other motorised vehicles (as they will also be responsible for emissions), this assumption means that the revenue calculated below will be an *underestimate* of the total that would actually be raised.

– **Composition of Jersey car stock**—the composition of the existing Jersey vehicle stock in terms of emissions is not known. Therefore, the VED profile of Jersey's total vehicle stock is assumed to be equal to the UK's VED profile for *new* car sales. Since newer vehicles tend to have lower emissions, this assumption may underestimate the number of cars with higher emissions, and as such tax revenues may be *underestimated*. Given the higher per-capita incomes in Jersey, this approach may also underestimate the number of larger and more expensive cars in the stock, which is again likely to underestimate the number of higher emission vehicles in the stock and therefore the tax yield.

Table 4.2 shows the revenue from a VED in Jersey using UK VED bandings. The revenue estimates assume that there is no response by car owners. If car owners respond to the (limited) fiscal incentives by purchasing low-emission vehicles, the resulting revenues would be lower.

[60] Source: Jersey Statistics Unit (2003), 'Jersey in Figures 2002'; and Oxera calculations.

Table 4.2 Revenue of a VED, with UK VED rates, in Jersey

Bands	UK VED rate for petrol car	% of new UK car sales	Number of cars	Revenue (£/pa)
A	0	0	0	0
B	40	3	2,514	100,567
C	100	31	23,466	2,346,567
D	125	25	18,971	2,371,328
E	150	17	13,104	1,965,631
F & G	200	24	18,133	3,626,513
Total	**137**	**100**	**76,187**	**10,410,607**

Notes: Figures do not sum due to rounding. New car sales are only available jointly for categories F and G. The joint F & G rate is based on the average of the rates in the two bands. The number of cars in each of the band is obtained by multiplying the % of new UK cars sales by the total number of cars in Jersey (76,187).
Source: Rates and bandings: House of Commons Environmental Audit Committee (2006), op. cit.
New UK car sales: The Society of Motor Manufacturers and Traders Limited (2006), 'UK New Car Registrations by CO_2 Performance', April.
Total number of cars in Jersey: Jersey Statistics Unit (2006), 'Jersey in Figures, 2005'; Statistics Unit (2002), 'Statistical Review 2002'; and Oxera calculations.

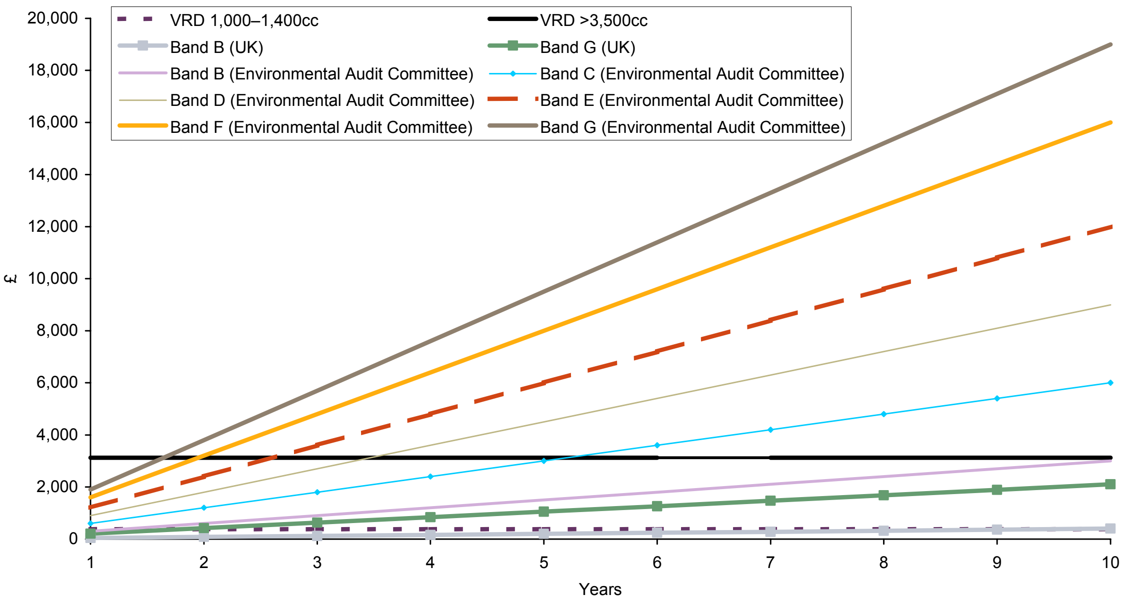
Under the assumptions made, a VED could be expected to raise around £10m from car users. The actual revenue is likely to be higher, since other vehicles would also be covered by the tax. Of these revenues, £3.5m could be used to replace the loss of revenue from abolishing VRD when GST is introduced. The remainder, £7.5m, could be used to finance Transport Plan spending measures.

The current ratio of the VRD between vehicles with large engines (ie, over 3.5 litres) and those with small engines (eg, 1.2 litres) is significantly greater than would be likely to arise under a VED using current UK rates. The VRD has a ratio of approximately 8:1 (£3,125 and £375 respectively), while band F compared with band C (which is where these car could be expected to lie) only has a ratio of 2:1 (£200 and £100).

If a wider banding were to be adopted by the States—eg, in line with the proposals by the Environmental Audit Committee—in the short run, revenues could be expected to be substantially higher than under a UK VED, since most vehicles would be taxed at a higher rate. As car owners respond by purchasing low-emission vehicles, the tax revenues would be reduced. Using a £300 pa difference for each band, the initial tax-take would be around £74m. However, the top rate of nearly £2,000 could be expected to result in some switching of ownership, and at these levels it would also be expected that importing and exporting second-hand cars would become economical in spite of the (ferry) transport costs involved. Thus the longer-term yield could be expected to be considerably lower than this (with a commensurate reduction in emissions).

To illustrate the fiscal incentives that car owners face under different vehicle taxes, Figure 4.1 compares the tax payable for different car types under Jersey VRD, current UK VED rates and VED rates as proposed by the Environmental Audit Committee, assuming that a vehicle is owned from new and scrapped after ten years. (The calculations assume that the tax rates remain constant over time and that vehicle owners value £1 today in the same way as at any given point in the future—ie, future payments are not discounted. Discounting would flatten the VED payment profiles.)

Figure 4.1 Comparison of cumulative amount of tax payable over ten years under Jersey VRD, current UK VED and VED rates proposed by the Environmental Audit Committee



Note: The VRD rates refer to the vehicle class with the highest rate and apply to a vehicle first registered in Jersey, or first registered outside Jersey within the past year.
Source: Oxera.

A VRD is payable only once, at the time of purchasing the vehicle, and the payment profile is therefore flat. Under the highest UK VED tax rate (Band G (UK)), the total amount payable over a period of ten years is lower than the current VRD. VED is payable into perpetuity (assuming that it is not abolished), so if the car was not scrapped after ten years, the total amount payable would eventually be greater than under a VRD. However, under realistic assumptions about a car owner's personal discount rates, it is likely that the value of the maximum UK VED rate is less than that of the highest VRD payment. Although the VRD and VED categories do not match exactly, it is likely that cars attracting the highest VRD rates would also attract the highest VED rate. For these cars (eg, large four-wheel drive vehicles) the Jersey one-off VRD represents a higher tax than the UK annual VED. For cars in the 2–2.5 litre range that are also in band F, the Jersey VRD would be £1,250 and the UK VED would be £190 per annum. Using a 10% discount rate and the assumption that the car is scrapped after ten years, these taxes are broadly equivalent. For small cars of less than 1 litre, which are in band B, the UK tax is £40 per annum and the Jersey tax is currently £125. For these cars the Jersey tax is considerably lower. Overall, therefore, and subject to the fact that engine size and emission per kilometre do not coincide exactly, the Jersey VRD structure already provides a greater incentive to lower emissions than the UK VED.

However, if the VED banding suggested by the Environment Audit Committee were adopted, that level of VED would create greater financial incentives to purchase low-emission cars than the current Jersey VRD.

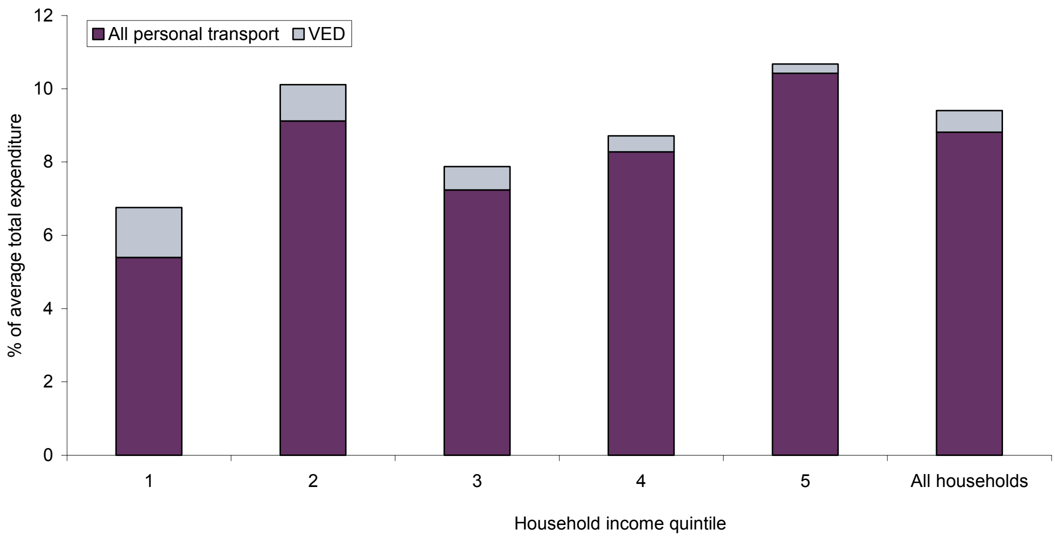
4.2.4 Distributional impact

The broad distributional impact of a VED can be measured by reference to the proportion of incomes or expenditure paid in tax by different income groups. Note, however, that income is an imperfect measure for car consumption choices, and an individual with a high income may choose to buy a low-emission vehicle, while the opposite may be the case for a low-income household. There is an empirical positive relationship between engine size and price, and a relationship (albeit relatively weak) between engine size and CO_2 emission levels. High-income households tend to buy larger, more expensive cars, and given that the VED rate is higher for high-CO_2-emitting cars, it is possible that these households pay more in emission duties. High-income households may also own more cars. However, this does not imply that a VED is necessarily progressive, in terms of the proportion of income paid in tax. Even though the high-income group may be paying more in absolute terms, it is not clear whether it will be paying more as a share of its income compared with lower-income groups. Abstracting from the potential corrective effect that the spending of the tax revenues may have, the distributional effects of the introduction in Jersey of a UK-style VED are likely to be regressive rather than progressive.

To calculate the distributional impact of a VED in Jersey, total household expenditure can be used as an approximation for household income. Figure 4.2 shows current household expenditure on all personal transport (ie, excluding public transport) as a proportion of total expenditure for each income quintile. Households in the bottom quintile have the lowest expenditure share on personal transport with those in the fifth quintile having the highest.

Assuming that the revenue from a VED on motorcars was around £10m (see above), approximately £7m of this will come from households.[61] Under the assumption that the representative household in each quintile has the same number and type of cars, household expenditure in each quintile increases by the same amount (£195). The resulting distributional impact is shown in Figure 4.2. Under the above assumptions the VED is regressive.

Figure 4.2 Distributional impact of UK VED structure in Jersey: same car types for each quintile



Source: Jersey Household Expenditure Survey 2004/05; and Oxera calculations.

However, the regressiveness of the tax as depicted in the graph is likely to be exaggerated. Low-income households are likely to have fewer cars per household and own different types of car than higher-income households. Moreover, the share of personal transport expenditure *including* VED in total expenditure is overestimated since it includes the current expenditure on VRD. However, while lower-income households may own fewer and smaller cars, to the extent that these are older they may have relatively high emissions and thus incur a higher levy.

[61] At the time of the 2001 census, there were 35,635 households and the average number of cars per household was 1.42 (Source: Jersey Statistics Unit (2006), 'Report on the Jersey Annual Social Survey 2005'). The number of cars among private households was therefore 50,854. Using the car sales weights as in Table 4.2 yields a revenue of £6.95m.

In addition, within each quintile the distribution of the tax burden among households is likely to vary substantially, reflecting the different consumption choices made in the same broad grouping.

For example, those without cars will not be affected by a VED—or very little, to the extent, for example that the VED on taxis is passed through to passengers in higher fares. There is also likely to be a substantial variation in the number of cars owned by households and the actual tax incidence on each household will thus differ considerably from that depicted in the Figure 4.2.

The distributional impact can also be explored by considering two representative households, one from the lowest-income quintile with an average total expenditure of around £14,500 and another one from the top quintile with an expenditure of £77,500.[62] Suppose that a representative household from the bottom quintile owns a VED band B car, and that a typical household from the top quintile has a car belonging to band G.[63] Under a UK-style VED, they would have to pay £40 and £210 per year respectively. The proportions of their annual household expenditure in tax are shown in Table 4.3

Table 4.3 Illustrative impact of a UK VED on household income

Quintile	Type of car (UK VED band)	Tax payable (£ pa)	Total expenditure (£ pa)	% of household expenditure on VED (£ pa)
Bottom	Band C	40	14,500	0.28
Top	Band G	210	77,500	0.27

Source: Oxera.

In this example, the high-income household is taxed at a very slightly lower proportion of its yearly disposable income than the low-income household. So for these two representative households, the VED would be only mildly regressive. Consider the other extreme: the bottom quintile household owning a car in band G, and the highest-quintile household owning a low-emission band B car. With similar calculations, the proportions of yearly disposable income spent on the tax would be 1.4% and 0.05% respectively.

The above discussion considers the direct distributional impact. However, the distributional impacts of any tax should take into account the redistribution of any *benefits* arising, not just the distribution of costs. For example, the potential regressive effects derived from the application of the VED (distribution of costs) may be corrected to a certain extent by redistributing the tax proceeds in a progressive way, such as by improving bus services, which is likely to benefit those that are less affluent.

Distributional consequences during transition from VRD to VED

An issue of double taxation could arise during the transition of VRD to VED. While there are cars remaining in the Island that were purchased under VRD, their owners would have paid two types of tax aimed at altering their purchasing decision, while new owners would only face the VED tax. It could be argued therefore that these vehicles are being taxed twice, once when purchasing the car under VRD and then under VED, although this would only be a short-term issue. This is likely to be counteracted by an interaction with GST, as vehicles purchased prior to its introduction would be exempt from the tax, while those purchased subsequently would be liable.

[62] Source: Jersey Household Expenditure Survey 2004/2005.

[63] These consumption decisions would yield the most progressive outcome since the high-income agent is paying the highest tax rate and the low-income agent is paying the lowest rate. Note that band A is not used because the number of cars falling into this category is likely to be insignificant in Jersey.

4.2.5 Economic impact of VED

The economic impact of a VED at the levels similar to that currently levied in the UK is likely to be relatively limited. Businesses' profit margins may be reduced to the extent that the tax imposes any additional direct costs on them. If the affected businesses are able to raise their prices, this will result in a reduction of disposable personal incomes of their customers (ie, Jersey residents).

There may be a specific impact on the car-rental business, but a VED is likely to be a small proportion of total costs within that industry and, unlike the VRD, the annual nature of the tax would have less impact on the re-export of ex-hire cars into the second-hand market in the UK. To the extent that, under a higher rate, the number of cars per household would be reduced, a reduction in congestion may result in an economic benefit in terms of journey time saved for both businesses and private individuals.

Like all taxes, the main impact will be on Jersey residents, and will be a reduction in their disposable income. At £10m pa, this tax would represent approximately 0.3% of the Island's Gross National Income (£10m of £3 billion).

In general, any economic costs produced by the taxes may be partially offset by the economic or environmental benefits generated by the spending measures that are financed via the tax.

4.3 Fuel duty

4.3.1 Environmental impact

Fuel taxes increase the marginal cost of journeys undertaken. Unlike the VED, fuel duty has a fiscal impact on the choices made by users after they have acquired a particular car. To the extent that higher journey costs reduce the propensity to make that journey, there is potentially a direct relationship between fuel duty and congestion, and a knock-on effect on emissions. They may therefore produce environmental benefits by reducing the number of car trips (eg, by encouraging switching to other modes of transport or car-sharing) and thus the total amount of fuel used. In addition, differentiated rates of duty for different types of fuel may be used to incentivise switching towards fuel that produces fewer pollutants. In the longer term, car users may also respond to higher fuel prices by switching to more fuel-efficient cars. Similar to a reduction in car usage, this would lead to a reduction in emissions and thus an improvement in local air quality, but would not necessarily reduce the number of trips taken. Indeed, as a result of acquiring more fuel-efficient cars, the marginal cost of trips declines and there is therefore an incentive to make more trips.

However, the extent to which fuel taxes reduce fuel consumption has been shown to be relatively low, so that increasing fuel duty slightly is likely to be ineffective at reducing the number of trips in Jersey, particularly during peak times when the demand for car transport from those travelling to work is likely to be fairly fuel-price-insensitive. This is likely to be particularly pertinent to Jersey since the average car/van journey length is very short (3.3 miles)[64] and hence fuel costs make up only a relatively minor part of the total cost of owning a car (ie, running, maintenance and purchase costs). To illustrate the impact, at five miles per litre, the additional cost of the average journey to work of a 10p-per-litre tax would increase by around 7p.

While increases in fuel duty are likely to be fairly ineffective at reducing congestion and emissions (particularly during peak hours when demand for car usage is likely to be highly price-inelastic), they have been shown to be effective at raising revenues.

[64] Source: Jersey Statistics Unit (2006),'Jersey Social Survey 2005', Table 4.2.

Rate differentiations

A number of countries use rate differentiations for certain fuel types. Most countries have lower tax rates for diesel than petrol. While diesel cars are more energy-efficient than petrol vehicles, thus causing lower CO_2 emissions, current diesel technology also has some environmental disadvantages in that it produces more NOx, particulates and noise. Some countries, including the UK and Jersey, therefore charge the same level of duty on diesel and unleaded petrol.[65]

A common distinction is based on the sulphur content of fuels, particularly that of diesel. For example, in the UK and other countries, the introduction of a lower tax rate for low-sulphur diesel and petrol has resulted in high-sulphur varieties virtually disappearing from the market. As a result of the reduction in demand for cars with engines requiring these types of fuel, there has been a shift in the car manufacturing industry towards vehicles that require (or at least that can use) less-polluting fuels. For example, the reduced availability of cars requiring leaded petrol, together with a shift in environmental awareness, is likely to explain the large reduction in leaded petrol in Jersey, which constituted around 60% of fuel consumption in 1991, to less than 2% in 2005.[66]

4.3.2 Revenue-raising potential of fuel duty

The current duty on diesel and unleaded petrol, which makes up around 90% of motor fuel sold in Jersey, is £0.38 per litre.[67] During 2005, the revenues from road fuel duties in Jersey were £18.5m, showing the high revenue potential of fuel duties.[68]

Table 4.4 shows the potential revenues from increasing the Jersey fuel tax (£0.38 per litre as per 2006) by different amounts under the assumption of a road fuel consumption as per 2005 (around 50m litres).[69] The table shows the net yield from the increase in duty under the assumption that consumers do not reduce their consumption of fuel as a result of the rate rise. The table also provides revenues adjusted for a reduction in consumption following consumers' response to the rate rise. The relevant parameters are taken from an international survey on fuel price demand elasticities. They may be taken only as indicative responses, which may not accurately reflect the actual likely demand response in Jersey (as stated above, the response may be relatively low since petrol costs form a relatively small component of running costs).

Table 4.4 Revenue from an increase in fuel tax (£m)

Scenario	No behavioural response	Short-run response: low potential response rate	Long-run response: high potential response rate
2006 rate + £0.10/litre	5	4	3
2006 rate + £0.15/litre	8	6	5
2006 rate + £0.20/litre	10	8	6
2006 rate + £0.25/litre	13	10	7
2006 rate + £0.40/litre	20	16	9

Source: Oxera.

[65] See OECD (2006), 'The Political Economy of Environmentally Related Taxes'.
[66] Source: Jersey Statistics Unit (2006), 'Energy Trends 2005'.
[67] The duty on super unleaded petrol is marginally higher at £0.40/litre and £0.41/litre for high-sulphur and/or leaded petrol and diesel.
[68] Jersey Statistics Unit (2006), 'Jersey in Figures 2005'.
[69] Ibid.

International fuel duty rates
The tax rates on motor fuels vary considerably between countries. The UK has one of the highest rates among OECD member countries (£0.56 per litre of leaded petrol, £0.47 per litre of unleaded petrol, and £0.47 per litre of diesel[70]). In monetary terms, the Jersey petrol duty rate (£0.38) is somewhat above the average rate of OECD member countries.[71] However, when adjusted for differences in purchasing power, Jersey rates are likely to be at the average or below the average of OECD countries. As highlighted above, most countries have lower rates for diesel than petrol and Jersey rates for diesel are therefore above average.

4.3.3 Distributional impact

The overall distributional effects of a fuel tax are regressive, as fuel consumption is not closely correlated to levels of income. Therefore, as fuel is taxed, the proportional effect on income reduction is greater for lower-income groups.

Household expenditure for 2004/05 shows that spending on petrol, diesel and other motor oils as a proportion of income is highest for households in the bottom income quintile and lowest in the top quintile (2.2%, 2.1%, 2%, 2%, 1.7% in quintiles 1 to 5 respectively). A fuel duty would approximately raise these percentages proportionately and is therefore mildly regressive. Table 4.5 shows the distributional impact of an increase in fuel duty of approximately 10p and 40p. The impact of these increases on total average expenditure in household income quintiles is assumed to be equal to a 10% and 40% increase in household spending on the petrol, diesel and other motor oils category in each quintile. Hence households are not assumed to change their overall consumption patterns as a result of the increase.

Table 4.5 Direct distributional impact of fuel duty

	Quintile					
	1	2	3	4	5	All households
Household expenditure on petrol, diesel & other motor oils (£ pa)	312	416	624	900	1,326	697
% increase in household expenditure; 10% increase in fuel duty (10p)	0.22	0.21	0.20	0.20	0.17	0.19
% increase in household expenditure, 40% increase in fuel duty (40p)	0.87	0.84	0.82	0.81	0.69	0.77

Source: Jersey Household Expenditure Survey 2004/05; and Oxera calculations.

However, the distribution of the tax burden among households is likely to vary substantially within each quintile. Households without a car are not directly affected by the tax, but may pay indirectly if the fuel duty feeds through to higher prices on other consumption expenditure and the price of the transport that they do use—for example, buses and taxis. The impact will also vary according to the fuel efficiency of the car(s) owned in each household and the total distance travelled by car.

4.3.4 Economic impact of increases in fuel duty

The economic impact of moderate increases in fuel duty is likely to be relatively limited. The additional cost of fuel may put some pressure on businesses' profit margins, particularly for businesses for which expenditure on fuel is an important component of overall costs. If the affected businesses are able to raise their prices, this will result in a reduction of disposable personal incomes for their customers (ie Jersey residents).

[70] Source: HM Revenue & Customs.
[71] Source OECD (2006), 'The Political Economy of Environmentally Related Taxes'.

In general, any economic costs resulting from taxes may be partially offset by the economic or environmental benefits generated by the spending measures that are financed via the tax.

4.4 Parking management

4.4.1 Environmental impact

The use of parking management policies can contribute significantly to managing traffic growth in urban areas. Policies include the control of the supply of spaces, restricting duration, and the use of parking permits and parking charges. Parking is discussed in detail in the Transport Plan.

If parking is to be used as a policy to alter car usage patterns, given the objectives of the Transport Plan, changes affecting the availability and the price of parking would need to be targeted at those car users contributing to congestion during peak hours. An important element of the traffic during peak hours is car users on their way to work and, as such, measures could be targeted at this group. The effectiveness of parking policies depends upon the mix of parking that is publicly controlled. In the town area of St Helier, of a total of 12,250 parking spaces, 5,250 are public and 7,000 are private (non-residential). While some commuters are likely to use public parking, the ability to alter commuter behaviour through increases in public parking charges is therefore likely to be constrained by the lack of direct control over the private parking stock.

However, although the provision of private parking may appear to be free to the parker, under most conditions the provision of private parking spaces is already a cost to businesses. Where businesses are not required to provide parking for their employees, the choice to provide parking is associated with an occupancy cost to that provision payable by the business (at least in the medium term where the car parking space could be put to an alternative use). A relatively small tax on private parking is, therefore unlikely to change the total costs of that parking provision significantly, so is unlikely to make a significant difference to the provision of such parking spaces.

Even if the users of the private parking space are made to pay the tax directly, there is likely to be no, or only minimal, impact. If it was possible to persuade users to not use their cars by inducing a small rise in the costs of doing so, firms that do not provide parking for their employees would need to pay their employees very slightly more, but could then avoid the costs of provision of private parking. Private parking would, under these circumstances, be uneconomic to provide. Since this does not appear to be the case in Jersey, it is unlikely that a small tax on private car parking would result in a significant reduction in its use or provision.

There may be a case on equity grounds for applying any tax on car parking to both private and public parking. However, in the case of private parking, in the long term it is unlikely to make much difference to the demand for parking whether the liability for the tax is placed on the actual user of the parking space (eg, employee) or the provider of the parking space (eg, employer). In the short term the impact may be different—if the tax is applied to the providers (ie, employer) of private parking, its decision to reduce its tax liability is likely to be possible only infrequently—ie, when acquiring commercial space or redeveloping an existing building. However, if applied to users, they can reduce their tax liability even in the short run, by changing their mode of transport to work.

Current public car park charges are set at 50p per unit, which represents either one or two hours of parking depending on the car park. Unless these are increased substantially (ie, more than the 10% increase proposed in the Transport Plan), this is unlikely to result in a significant change in car usage, as it is likely to have minimal impact on the total costs of the commuter journey. As charges are levied for a maximum of nine hours per day, the 10%

price increase represents an increase of 45p (at one unit per hour) or 25p (at one unit per two hours) per day.

4.4.2 Revenue-raising potential of parking charges

The Transport Plan estimates that that a 10% (5p) increase in public parking charges would raise £360,000 per annum. It is unlikely that car users would alter their behaviour as a result of this increase. Given 7,000 private parking spaces, a tax of £2.00 per week per space would raise around £730,000.

4.4.3 Distributional impact

Household expenditure for 2004/05 shows that spending on parking is lowest for households in the bottom income quintile and highest in the top quintile (0.22%, 0.24%, 0.32%, 0.33% and 0.37% in quintiles 1 to 5 respectively). An increase in parking charges is therefore progressive, reflecting different car usage patterns of high- and low-income households. Table 4.6 shows the distributional impact of hypothetical increases in parking charges by 5p and 50p. The impact of these increases on household expenditure in household-income quintiles is assumed to be equal to a 10% and 100% increase (5p and 50p per unit respectively) in expenditure on parking (all parking is assumed to be charged at the public parking charge of 50p per unit plus the corresponding increase). Households are assumed to not change their overall consumption patterns as a result of the increase.

Table 4.6 Direct distributional impact of increased parking charges

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	All households
Household expenditure on parking (£ pa)	31	47	99	146	286	120
% increase in household expenditure: 10% increase in parking charge (5p)	0.02	0.02	0.03	0.03	0.04	0.03
% increase in household expenditure: 100% increase in parking charge (50p)	0.22	0.24	0.32	0.33	0.37	0.33

Source: Jersey Household Expenditure Survey 2004/05; and Oxera calculations.

However, this general pattern of the distribution of the increase in parking charges among households is likely to vary substantially within each quintile and is related to the number of cars in each household and length of stay in paid-for parking spaces. Those without cars, or those who do not use charged (public) parking, will not be affected by the increase. For a household in the lowest quintile, parking five days per week in the most expensive car parks, the maximum increase in parking charges at £2.25 per week would represent less than 1% of total expenditure.

4.4.4 Economic impact of parking charges

The economic impact of modest increases in parking charges such as those proposed in the Transport Plan is likely to be insignificant. For larger increases, the number of trips undertaken may be reduced, and the resulting reduction in congestion could lead to an economic benefit in terms of the time saved during journeys for both businesses and private individuals. If increases in parking charges are sufficiently large to induce shoppers without access to private parking (ie, where no private parking is supplied) to look for alternative shopping areas—to the extent that these are available—businesses in affected areas may experience a reduction in turnover.[72]

[72] Assuming that alternative modes of transport are not good substitutes for car transport, either because the cost is similar or it is less convenient for shoppers.

5 Land taxation

In addition to the environmental policies outlined above, Oxera has been asked to examine the following land taxes.

– Development land taxation and planning obligations to capture part of the uplift in land value that occurs when land is reclassified for development.

– Land taxation—land taxes are currently already in place in the form of parish rates.

These taxes are not classified as environmental taxes, but they can be used to raise funds to achieve environmental objectives (development land tax or tax on land value) or require developers (through planning obligations) to pay for projects that provide environmental improvements.

As there are no specific environmental objectives associated with these taxes; the analysis of these policy options relates only to the distributional and economic impact of the taxes.

5.1 Development land taxes

5.1.1 Objective of development land taxes

Demand for land is a derived demand and, as such, its capital value depends on the use(s) to which it can be put. Because the economic returns to agricultural land or greenfield sites are relatively low, the capital value of such land is also low. However, land that can be (or is) used for housing, offices etc can either deliver relatively high returns (eg, rental income) or has a high consumption value in its own right (eg, owner-occupied housing). As a result, the value of development (or developed) land is very much higher than that of agricultural land. Therefore, decisions by public planning agencies to reclassify land from agricultural to, for example, development land for residential housing or commercial use tends to be associated with a (very) large uplift in the value of that land.

The uplift in land value is not owing to the landowner's efforts in adding value to their land, but is the result of a public agency decision acting on behalf of the wider community. As a result, the decision of the public body acting on behalf of the community provides a windfall gain to the land owner. A levy (tax) on land windfall gains can therefore be justified on grounds of fairness as it (at least potentially) distributes the benefit of that windfall gain more widely, and can be used as a policy tool to share with the wider society the otherwise purely private benefits of the decision.

5.1.2 Tax design

Several fiscal measures can be used to capture part of the uplift in land tax value. The most direct way consists of a tax on the difference between the values of the land prior to and after re-zoning.[73]

Some form of development land tax has been tested in the UK, but with limited success, and they were eventually withdrawn. The UK experience highlights the importance of an efficient

[73] Further options include taxing the gain through a stamp duty or a capital gains tax. For further details see Appendix 2 of Oxera (2005), 'Which Tax is Best Suited to Jersey's Objectives? An Evaluation of Alternative Tax Options', February.

tax design and of ensuring that a taxable transaction arises. The success of previous taxes in the UK was hampered by the following.

– **Tax rates**—taxes were set too high and discouraged landowners from releasing their land for development.

– **Credibility**—taxes tended to lack credibility such that landowners expected them to be repealed. It was therefore in their economic interests to hold back the sale in the expectation of making higher (because untaxed) windfall gains in the future.[74]

– **Avoidance**—the complexity of the taxes allowed landowners to engage in elaborate avoidance schemes.

Following the recommendations in the Barker report on the supply of housing, the UK intends to try again, and to introduce a 'planning gain supplement', levied at the point of awarding planning permission.[75] The revenues are intended to finance local infrastructure improvements or to redress any issues (eg, increased traffic) that may arise as a result of a development.[76] The planning gain supplement charge will be based on the value at the time full planning permission is granted, but payment will not be required until development commences.[77]

5.1.3 Revenue potential

Calculations by the Jersey Treasury indicate that the increase in the value of land that is reclassified from agricultural land to residential housing development land is substantial, increasing value by between 80 to 200 times following reclassification (ie, a field that is worth £10,000 as agricultural land could be sold for between £800,000 and £2,000,000 if it is reclassified as housing land). The Treasury estimates that the total overall uplift in value of land as a result of reclassification in 2002 was around £32m (ie, in broad overall terms land that was worth £2m became worth around £34m, using an average multiplier of 150).[78] While potential revenues from a land tax may be substantial, the revenue streams are likely be lumpy, since the number of taxable actions (eg, the award of planning permission or the commencement of a development) is likely to vary on a year-on-year basis.

It is also possible that, as a result of other policies, no changes of use (that lead to an increase in value) are sanctioned over a considerable period of time. This would result in no tax base, so no tax revenue would be forthcoming.

5.1.4 Tax incidence and distributional impact

An important aspect of the tax is whether the tax incidence is on landowners (the beneficiary of the gain) or whether there is any scope for the tax to be passed on to end-users in the form of higher house prices or higher prices for other land uses (eg, offices and retail). In a competitive market, if the tax is payable by the developers, they would have a strong incentive to ensure that landowners pay the full amount of tax. Otherwise the relatively higher price would render their properties uncompetitive compared with equivalent properties in the wider housing market. Developers would incorporate the tax into their negotiations and lower their bidding price accordingly. Even in small housing markets such as that of Jersey, or

[74] HM Treasury (2004), 'Delivering Stability: Securing Our Future Housing Needs: Barker Review of Housing Supply—Final Report Recommendations', March (hereafter referred to as the Barker report).

[75] Levying the charge at the point of granting full planning permission rather than the point of sale has the advantage of reducing administrative complexities and the potential for avoidance.

[76] In the UK one of the objectives of introducing the planning gain supplement is to encourage local authorities to approve developments and thus to increase housing supply. It is hence key that proceeds are (predominantly) allocated for local use rather than reallocated by central government via a nationwide central fund.

[77] HM Treasury (2005), 'Planning-gain Supplement: A Consultation', December.

[78] The uplift depends on whether the land is reclassified for building of 'Category A' or 'Category B' properties.

markets where either landowners or developers held some market power, it is likely that the tax would be paid by the landowner, and not by the subsequent land user of the re-zoned land.[79] However, this outcome is dependent on the tax having no impact on the flow of land being reclassified.[80]

5.2 Planning obligations

Instead of recovering some share of the uplift in land value through a formal tax, developers could be required to provide a specific benefit through a system of planning obligations. The form of these benefits could be the outcome of a bargain between the developer and the planning authority. The *theoretical* outcome would be similar to a land development tax, with the monetary value of the planning gain representing the tax on the uplift in land value. Jersey has a policy of planning obligations, 'intended to ensure that the negative aspects of new developments are minimised and that such developments provide social, economic and environmental benefit, to the community and the Island as a whole'. [81]

However several issues arise in the context of using planning gains as a tax measure to capture uplifts in land value. Unlike a land development tax, which is set in advance, the financial commitments imposed on a developer by a planning gain are likely to be largely unknown to the developer in advance, as they are decided on a case-by-case basis. At the time of purchasing the land from landowners (ie, assuming that the developers are not yet in the possession of the land prior to re-zoning), developers therefore cannot fully factor the financial implications of the planning obligations into the bidding price. The uncertainty at the stage of land purchase results in planning gains being less likely to be effective in targeting the tax at the beneficiary of the planning decision (ie, the landowner).

There are a number of impacts that could arise from this uncertainty, given the likely information asymmetry between those involved (landowner, developer, government). It is likely that the developer will have the best estimate of the price that the finished development will command (ie, the value of the land with the planning permission), the planning obligations that might be imposed (ie, before the planning gain requirements are agreed between the developer and the government), and the costs of any specific planning obligation actually imposed, and will use that information in its negotiations with landowners (on land acquisition) and with the government (in the negotiations on the specific obligation to be imposed). If the information asymmetry can be successfully exploited, the likely outcome is that landowners suffer a penalty of (slightly) more than the cost of the planning obligation, and that government receives (slightly) less than it could from the planning obligations that the developer would actually be willing to pay. As a mechanism of funding specific projects, planning gain is likely to be less *economically* efficient than a broadly equivalent land development tax.

In the UK, with the proposed introduction of the planning gain supplement, and as recommended by the Barker report, planning obligations could be reduced to cover only those areas relating to the physical environment of the development site and the provision of affordable housing.[82]

[79] There are some fairly extreme market conditions under which it may be possible that some of the tax is passed on to end-users. For further details see Appendix 2 of Oxera (2005), 'Which Tax is Best Suited to Jersey's Objectives? An Evaluation of Alternative Tax Options', February.

[80] If the flow of land for reclassification slows down as a result of the tax, land values of undeveloped land are likely to rise. Not as a direct result of the tax, but as a result of the reduction in the supply of 'developable' land. The price rise would also apply to land that is already developed, which is not subject to this tax.

[81] The Environment and Public Service Committee's use of planning obligations is set out within Policy G10 of the Island Plan 2002. Details of the policy are set out in States of Jersey, Environment and Public Services Committee (2005), 'The Use of Planning Agreements/Obligations', May.

[82] Department for Communities and Local Government (2006), 'Planning Obligations: Practice Guidance, July.

5.3 Land value tax

A land value tax is defined as the policy of raising government revenues by charging (annually or otherwise) each landowner a portion on the value of land *excluding* any improvements on it. As such, strictly speaking, it is different from a property tax, which includes the value of buildings and other improvements on the land. In practice, in locations such as Jersey, with a significant constraint on the supply of land, the value of land is the single largest component (perhaps around 75%) of the overall property price. Under such circumstances, a land tax and a property tax can be regarded as broadly synonymous.

If the tax is imposed as an annual tax, a portion of the uplift in the value of land resulting from re-zoning would be captured and could be used for purposes that benefit society as a whole (eg, developing the local infrastructure). Similarly, any measures that tend to reduce the value of land (eg, increased noise of airports), would be reflected in a reduction in the charge on the property. However, the annual tax rate on land values would need to be very small, compared with the one-off tax rate that would be possible using a development tax. Thus, as a way of taxing the *increase* in land values as a result of re-zoning, a land value tax is likely to be inefficient.

5.3.1 Tax incidence and distributional impact

A land value tax essentially taxes the holding of one form of wealth. If levied as a portion of the value of the land, the tax is progressive, insofar as those holding more wealth of this form pay more (in £s) tax. However, holdings of this kind of wealth are not necessarily directly correlated with income, so the incidence of the tax with respect to income is likely to have some less progressive impacts. In particular, because housing is a significant part of the tax base, there are a number of groups that are likely to end up paying a higher proportion of their current *income* in tax, compared with other groups. These groups include pensioners who continue to reside in the houses they occupied before retiring (eg, in their own homes that they now own outright), large families who require relatively large houses, and residents who, by chance, have lived a long time in areas that have experienced larger relative increases in house prices.

A land value tax can potentially be levied on the users of land or the owners of land, or both. Irrespective of precisely where the responsibility for the tax lies, adjustments to the economy are likely that will reduce the difference in the long-term impact of the tax between the two systems. For land that is an input for commercial activities, the tax is likely to end up partly in an increase in the price of that output—ie, consumers end up paying the tax—and partly in a reduced capital value of land (in which case current owners pay the tax). For internationally traded output, some of the tax may end up in lower wages to maintain international competitiveness. There will also be a differential impact depending on the goods/services being produced. Activities where the cost of land is a relatively high proportion of input costs will experience a higher proportionate increase in costs compared with activities where the cost of land is a small proportion of input costs.

For land that is part of a consumption product—mostly housing—owner-occupiers will pay the tax, partly from income and partly as a reduction in the capital value of houses. For those in private sector rented accommodation, the final incidence of the tax is likely to be split between owners and occupiers. Exactly how it would split would depend on the price elasticity of demand for housing. If total demand is not very sensitive to price, owners will pass on the cost of the tax to occupiers, but if demand is sensitive to price, owners will end up paying the tax (even if the occupiers nominally pay the tax through being unable to charge rents that are as high as when the tax was absent).

Jersey already imposes a property tax in the form of parish rates on homes and businesses.[83] Increasing the parish rates (or imposing other land value taxes) would require careful consideration of the interactions with the government's policy of subsidies to provide affordable housing. A significant proportion of households in Jersey currently receives housing subsidies,[84] and any increases in tax payments relating to housing may require corresponding increases in housing subsidies in order to meet the objective of housing affordability. However, were housing subsidies to be increased, this could have a knock-on effect on the housing market. In particular, any market pressure to reduce rents would be diluted, with the result that, although those receiving the housing subsidy would be protected, those falling outside the subsidy system would not, and may be worse off in the presence of subsidy payments. In addition, any additional subsidy would reduce the net yield from a land value tax. Before adopting any significant land value tax, the full economic impacts on the wider housing market would need to be carefully examined, which is beyond the scope of this report.

One of the most significant obstacles to implementing land value taxes is the valuation process. To capture any changes in value (large uplifts or otherwise), the notional value of land would need to be updated frequently in order to impose a 'fair tax'. Under a land tax that attempts to track the actual land value closely, a large increase in tax liability would result from land re-zoning, even before the gains from that re-zoning are realised (eg, through the sale of the land) and, as such, may lead to additional equity concerns.

Land value or property taxes tend to be used for revenue-raising purposes to pay for things that are directly related to occupancy, such as municipal services or infrastructure investments, rather than to address environmental concerns.

[83] For the purpose of the parish rates, land is defined as a) any house, building or other structure in, on, under or over the land; b) land covered with water, except, subject to paragraph (c) of this definition, land covered or, in the normal course of tides, from time to time covered by sea water; and c) land formed by dividing the ownership or occupation of land horizontally. Source: www.parish.gov.je.

[84] In 2001 around 14% of households lived in social rented accommodation. Source: Jersey Statistics Unit (2002), 'Report on the 2001 Census', October. In addition, a large proportion of Jersey households receive rent rebates or rent abatements.

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