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Transport and Climate Change
Policies for harder times

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Introduction

Responding to Climate Change has been near the top of the agenda internationally and in many Countries for the last two years. Now, the financial crisis and recession are pushing it down the list. But it remains a stated priority in many Countries and in the EU. Even if it goes off the radar temporarily, the 2009 Copenhagen COP will bring it back to prominence. And when the economic situation improves it is very likely to go back up the agenda.

In any case, the economic downturn underlines the need to put in place policies that are sensible and cost effective. In this respect, Climate Change is a serious challenge. The science has many uncertainties, the costs of prevention or abatement are often unknown and the benefits and risks often unknowable. It is fertile ground for lobbyists and politicians looking for a quick fix. In such circumstances, there are serious risks of inefficient and wasteful policies.

My starting point is that Climate Change is a reality and what we are discussing is the best way to deal with it, through preventive measures and adaptive ones. Of course even within this framework there are many uncertainties, including on the global targets, on the speed at which they should be attained and on how the burden of meeting them should be shared. I will make some remarks on these issues without in any way being complete. Then, the focus will be on transport, as it is generally held to be one of the more intractable sectors. After a review of broad issues and trends worldwide I will say a few words about Ireland and the possibililities here. But first, a few words on targets and economics.

Targets and economics

Policy aims are often reflected in quantitative targets. But quantitative targets should not imply that they are to be attained irrespective of the costs. Biofuel targets are a good example. The 10% volumetric targets in EU and the targets in US did not take account of the direct and indirect costs of meeting them. The 4 billion euros in subsidies going to European farmers or the anticipated 16 billion dollars in the US is a direct consequence of such volumetric targets and almost certainly could have been better spent. Similar risks apply when targets are allocated among Countries or sectors. Finally, the starting and end dates for targets are also important, as Countries are at different points in their development.

On economic costs, The Stern review [1] is the best known in Europe and its thesis is essentially that the cost of acting now is likely to be more effective and cheaper than acting later. Stern argues that the cost of acting may be only 1% of total world GDP to 2050 and that of inaction may be in the range 5-20% of GDP. OECD and others have produced similar figures. And this has become the position of many Governments including Ireland's as typified by Bertie Ahern "Failure to act will be many times more costly than taking the necessary steps now". While this position has certainly strong political support its academic underpinning can be questioned. Studies,with William Nordhaus the best known proponent conclude that a more gradual approach

is best with limited abatement now and increasing efforts as incomes grow and understanding improves. However, this approach has come under criticism for its treatment of catastrophic risk. And emerging methods to deal with possible but unlikely catastrophic events arrive at recommendations more in line with Stern's.

If a target is set, the problem should reduce to finding the least cost way to achieve it. This is important for transport as the evidence is that emission reductions are on average more costly than in other sectors. This is because there is no readily available alternative technnology and because many behaviour patterns are difficult to change in the short term. Moreover, since road transport in Europe pays well over 200 euros in taxes per tonne emitted, it can be argued that existing technology has already adapted significantly. A related point concerns aviation; many experts believe that if aviation joins the ETS it will be obliged to buy permits from other sectors but will not be able to reduce emissions. A final point in this issue is that the UK's cost-effective abatement strategy to reduce emissions 50% by 2050 shows no reduction in transport before 2020.

At present in the EU, targets for the non-ETS sectors are being discussed. The non-ETS sector includes agriculture, housing and transport. Figures are not final, but for many EU Countries (including Ireland), targets are for somewhere between 15 and 20 percent reductions in emissions from 2005 levels. There is going to be a difficult discussion between Countries and sectors on how these reductions can be apportioned. The evidence we have is that the most cost-effective measures concern housing. But the entire exercise is dogged by analytical weaknesses and the lack of data on costs or benefits.

But let us look at the transport sector in some more detail.

The Transport Sector and Climate Change

The transport sector suffers from a serious strategic weakness. It is that, globally, it is over 95% dependent on fossil fuels and uses over 50% of all these fuels. This is a significant vulnerability, which other sectors do not have. Add the unstable sources of supply and the volatile and probably increasing prices and the need for diversification away from oil in the longer term becomes obvious. Here, markets will have a key role. This makes energy security different from climate change, with policy responses that are not necessarily the same. For example, biofuels may reduce energy dependence but may do nothing for climate change. Canadian tar sands are also a good answer to energy security problems but a poor one for global warming. Increasing fuel prices may bring about the market response to deal with energy security but do not necessarily help climate change, as for example they can make the extraction of previously uneconomic oil profitable. However, all policies to improve efficiency in the use of energy meet both aims with only the qualification that making conventional technology more efficient reduces the incentives for alternatives.

As regards global warming, the Transport sector is responsible for 14% of anthropogenic greenhouse gas emissions globally. These emissions include those resulting from land use changes and deforestation as well as emissions of greenhouse gases like methane and nitrous oxides. In terms of emissions due to energy consumption, transport is responsible for about 23% of global CO_2 emissions. This latter figure is 30% in the OECD Countries, which illustrates one of the critical issues for transport – the massive growth to come from developing countries. Both the 14% and the 23% are relevant and used. The higher figure is more

appropriate when we discuss energy and fuel use. Transport (including international air and maritime transport from Ireland accounts for 34% of CO_2 emissions from fossil fuel combustion.

In terms of the share between modes, road transport accounts for over three quarters of transport emissions and shipping and aviation most of the rest. While these latter modes have low shares, they are growing quickly.

Globally, transport is growing rapidly. The World Business Council expects the number of cars to triple to around 2 billion by 2050. Aviation forecasts are for more than a doubling of passenger traffic by 2025 and a tripling of freight. Container traffic is expected to grow three fold by 2020. While these forecasts can be contested of course, the general direction and strength of the relationships between economic growth and transport are clear.

As illustrations, car ownership in India has grown from 5 million in 1980 to 65 million now. But that is still far less than 50 cars per thousand people, while the US is at 800 and Ireland at 500. Internal aviation in China is expected to grow five fold in the next decade. Russia is expected to buy 4 million new cars this year.

The forecast growth in transport demand will inevitably be accompanied by a growth in CO_2 emissions. Our estimates are that global CO_2 emissions from transport will increase 50 % by 2030 and double by 2050 under present policies and trends [3].

When these traffic and emissions projections are set against the kinds of targets that Countries and international bodies are setting, it is clear there is an enormous gap between the real trends in transport and the political aims and aspirations for drastic reductions. Transport experts and professionals have been viewing these increasingly stringent targets with mounting trepidation as they see no set of sensible policies to meet them if they are applied to the transport sector.

The projections may surprise but it is useful to remember that transport growth is income-sensitive, with an income elasticity of 1 or more. Personal mobility is highly valued and as incomes rise an increasing share goes to transport. Moreover, income effects are generally stronger than price effects. Only very recently have we seen high fuel prices affecting car purchase choices and mileage driven.

Transport is also central to globalisation. While there is some anecdotal evidence of logistic supply chains becoming shorter due to high energy prices, the process of globalisation is not complete, and further freight growth is an inevitable consequence of the growth in international trade. It was expected in the 80s that, as economies changed to service economies, and as freight demand changed from heavy bulk products to consumer goods and lighter products, the elasticity of freight transport with respect to income would decline. The opposite in fact happened, and it seems likely that this reflects market opening and improved trade opportunities.

Transport is a derived demand, and growth is due to, or is associated with economic growth, increasing trade and a wide range of social and economic opportunities for people. Transport makes a strong and positive contribution to growth and prosperity. Decoupling transport from economic growth has been put forward as an aim (even by heads of state in the EU) but it is a dangerous and simplistic analysis. Reduce inefficiencies and decouple adverse effects, yes, but do not aim at reducing mobility itself.

These points matter because transport policy makers and politicians have consistently underestimated the forces determining mobility, and especially those leading to increases in private mobility. Apart from income, the factors favouring increased car ownership and use, such as more dispersed residences and work places as well as more complex trip patterns, not to mention its flexibility and speed, are strong and very difficult to change through policy interventions.

Transport policy tries to maximise accessibility while minimising costs, including external costs. These costs include the negative impacts. Despite the recent attention, it is still the case that there are more serious transport problems than climate change. Over 1 million people die on the roads annually. Air pollution, though improving dramatically, remains a serious health problem. The costs of congestion are very high in many cities.

Estimates of external costs show that other externalities have higher values than those for CO2 or energy dependence. Congestion externalities can be more than 10 times higher, air pollution and accidents externalities over 3 times higher [2]. One caveat is that these estimates for well-known externalities have low variances, while for climate change there is much greater uncertainty about the Climate Change externality estimates.

This implies that traditional transport policy aims to improve efficiency, reduce accidents, air pollution and congestion remain fully valid and should remain at the centre of policy. Many of the policies to reduce these externalities also benefit climate and their value is enhanced. But it is not a blank cheque and cost benefit analysis should remain the way that investment decisions are taken. And the way to deal with Climate Change in this respect is to put a price on carbon. The Stern review suggests about 60 euros a tonne.

But let us turn now to the measures both in place and those being put into place, so that we can see whether this gap is being narrowed.

Policy responses: The transport sector

A couple of years ago, we analysed over 400 policies that Countries said they were implementing to limit the impacts of Climate Change [4]. Most policies cited were uncosted and few had estimates of abatement impacts. We calculated that if all those policies were implemented fully, then the growth in forecast emissions would be reduced by between a third and a half. However, it is most unlikely that all measures would be implemented (just taking the Irish ones, few actually were, or were delayed). In any case these measures applied to the developed world.

Of these measures, most European countries put heavy reliance on the voluntary agreement with the car industry and on biofuels. Many cited their general support for public transport. A smaller number mentioned differientiated vehicle charges, especially the UK which could demonstrate the impacts. Taxes and charges were mentioned only a few times, as were transport demand management measures.

We evaluated the costs of the different measures and the potential benefits. This was inevitably approximative as most countries were not doing this. The measures that came out as most cost-effective were those linked to vehicle emissions and in particular incentives and charges that encouraged people to use more fuel-efficient cars. The measures that were cited most often, like biofuels, were generally the most expensive!

We are now updating this work [5]. One of the most striking developments has been that several countries recently introduced differentiated vehicle purchase taxes or feebates. These are effective, though the scope for even greater differentiation is possible. The industry is critical of these developments for several reasons. These include the suddenness with which they were introduced, but also the variety of different schemes, including endpoints inconsistent with labelling and fiscal schemes, and completely different rates. It might be suspected that there are also unstated objections since the attempt to downsize vehicles hits industry's most profitable sector.

As further examples, the London and Stockholm pricing schemes have reduced CO2 emissions significantly. Heavy goods vehicle charging schemes as in Switzerland and Germany have led to improved use of trucks. Other measures, like mobility plans, cycling policies, traffic restraint, bus lanes, all have made contributions in different places.

Most European Countries and Japan strongly believe that both technological advance and policy which brings about changes in mobility patterns are needed. And the arithmetic confirms this as without mobility change the deep cuts that are being promised cannot be obtained. Mobility change is mainly meant to imply that car users will reduce the number or length of trips or transfer to other modes. In freight transport, modal shift is also implied but also better organisation of goods delivery and logistics. The difficulty of bringing about such change has been consistently underestimated. If it is to happen, general aspirations will not work, and policy needs to be based on a more specific understanding of the way people and businesses make choices [6].

In the short and medium term, it is unrealistic to expect major changes in mobility patterns. In the longer term with policies applied over a long period relatively significant changes can occur. Until 2020, the great bulk of reductions will need to come from technical improvements.

On technology, the results of our recent work and that of the IEA are fairly clear. There is no technological panacea. Mass use of fuel cell or hydrogen vehicles with zero emissions are still decades away. Electric vehicles and plug-in hybrids are more likely to be on the market in the mid term. For these vehicles, there are battery performance requirements and distribution difficulties to be overcome as well as price differentials. There are differing views, but few see any significant market share for such vehicles before 2015.

Therefore, the principal contribution will have to come from existing types of vehicles. Our recent work and that of IEA indicates that up to 50% improvements in specific fuel consumption are possible over the next 30 years, on the proviso that none of the potential gains leak into increases in power or weight [7] [8] [9].

An important issue is the apparent unwillingness of consumers to buy fuel-efficient vehicles. The empirical evidence is that consumers are not ready to pay more for vehicles, even though it will more than pay back in fuel savings over the vehicles' life. In fact, consumers are loss-averse and seem to apply very high discount rates, up to 20%, to potential fuel efficiency savings. Such behaviour is common on energy products. This is at least a partial justification for regulating fuel efficiency. It is not clear whether other interventions could help align social and private discount rates.

One area where there are untapped possibilities is in road freight transport. Too much effort has gone in to trying to get traffic to switch to other modes and not enough to improving the fuel efficiency of trucks. There is evidence that hauliers are not as aware of the possibilities to reduce costs as might be supposed. Recent work in the ITF and IEA [4] shows that available efficiency technologies offer the potential for 30-40% reductions in trucking energy intensity. Moreover, hybridisation is promising in urban areas. Cleaning up and rationalising urban deliveries is also a potential source of gains.

The summary of our work is that there is no panacea; but there are a variety of actions that can contribute small though useful reductions.

Let us turn to examine the situation in Ireland.

Policy responses in Ireland

Transport CO2 emissions in Ireland were about 13 million tonnes in 2005 and, on a business as usual scenario, with population and economic growth as in the ESRI outlook, they could be at about 20 million tonnes by 2020. Ireland's percapita transport emissions at 3.7 tonnes are among the highest and, for example, well above Germany's at 2.2 tonnes per capita.

Reducing the 2005 level by around 20%, as sought in the EU, requires roughly a halving of per capita emissions. It is unlikely there is a set of implementable policies that can achieve this aim.

The lower income and population growth that will follow economic downturn will undoubtedly reduce transport demand growth and emissions. On the other hand, vehicle replacement decisions will be delayed and maintenance will be skimped so potential impacts through new fuel-efficient cars will be slower to work through. Recession is an unwanted ally and the need remains to concentrate on policies that are cost-effective and that set a long term framework for reductions.

The set of measures highlighted in the National Energy Plan [10] all seem reasonable enough and do not seem to make exaggerated claims for reductions. In total, they will yield not much more than 1-2 million tonnes. These include technology measures, spatial planning improvements, modal shift policies, public transport investment and transport measures in Dublin, even including road pricing.

A plan for sustainable transport is under preparation [11] and will aim at general improvements in transport efficiency as well as reductions in emissions**.** As I understand, it the plan's aims, in addition to contributing to climate objectives, are to reduce congestion, improve efficiency in network use, reduce accidents and air pollution. Policies to encourage walking and cycling and make efficient use of other modes are worthwhile policies. Car restraint in cities and even road pricing are also perfectly sensible. The major investment programme, Transport 21, is also expected to have a positive impact on CO2 emissions. In short, there are several actions in policy that can help to meet the objectives of transport policy as well as contribute to reducing CO2 emissions.

Since the plan is not yet available, I would like to give some suggestions on policy directions to limit CO2 emissions for Transport.

First, the key cost-effective policies are those centred on vehicle emissions. Here, the instruments available, fuel taxes, vehicle registration tax, the coming fuel economy regulations as well as consumer information can all work together to reduce emissions from new vehicles. From a motorist's perspective this is a pretty intimidating collection of taxes and charges already, so there is not too much room for manoeuvre.

However, Fuel taxes could be raised gradually over a few years to bring them closer to UK levels and incidentally avoid petrol tourism. The new VRT levels can make a difference and can be further differentiated to incentivise vehicle downsizing. They have worked in France and in the UK. On emission standards, Ireland should strongly support vehicle emission standards and should push for low levels like 90 gms per kilometre over the medium term. There are also a variety of technical improvements to cars, like fuel efficient tyres, low viscosity lubricants and efficient lights that can easily be supported through the association for motor traders and information campaigns. Ecodriving campaigns for both cars and trucks have been shown to be highly cost-effective,especially when reinforced by on-board feedback equipment.

Second, the road freight sector has more posibilities than has been recognised so far, through direct measures aimed at the vehicles and their use and not indirect ones related to modal shift.

Third, biofuels are no panacea. Support for biofuels has not been cost effective and a much more critical look is needed. The EU's 10% biofuels target was misguided and, in any case, would not reduce CO2 emissions by the same percentage. Ethanol from sugar beet costs from 400 to 500 Euros per tonne of carbon abated. Research for sustainable 2nd generation biofuels is, however, worthwhile.

Fourth, much is hoped from better integration of land use and transport policies.This is likely a misplaced hope, as there are still strong forces acting to increase dispersion and sprawl. In the same vein, too much should not be expected of Transport 21 in terms of CO2 emission reductions. While the public transport investment could reduce some car trips, the 18 billion euros destined for roads will increase road traffic.

Fifthly, behavioural changes are possible over time, and there is growing knowledge and evidence on how to bring it about in transport. Sometimes, quite small changes in car drivers' behaviour can make a big difference to traffic flow and congestion relief,though the climate benefits may be small.

But in the Irish context, the forces acting in favour of additional private mobility, including more complex trip patterns, urban sprawl, dispersion of activities, rigidities of housing markets and increasing wealth, have not played out, and dramatic reversals in present mobility trends are not realistic. Here, aspirational policy from central government is unlikely to work, even if backed up by significant spending.

But if there is strong support from society for reductions in CO2, then efforts to transfer responsibilities away from Central Government, to local authorities and cities, to transport companies and to major transport generators may make a difference. Public support, if it exists, for policies to deal with climate change needs to be captured and built on. Many companies now have "sustainability" plans. It needs to be tested whether these are not simply marketing efforts. Cities, companies and transport generators like shopping centres and sports venues need to be brought into the efforts.

Finally, aviation and shipping have been excluded from the Kyoto protocol and there is a debate now about how and when they will be included in the post-Kyoto framework. On the one hand, there are Countries who want to leave it to ICAO and IMO which have mandates. On the other, some European Countries want to let UNFCCC deal with this by integrating these modes in the global targets. The attention given to these modes, especially aviation, is increasing, and shipping emissions have been seriously understated in IEA data. Fuel accounts for half the operating costs of flights , so there is a strong incentive to minimise these costs already. There are risks in joining regional emissions trading schemes as on the one side it is likely to be a tax without emission reductions and on the other could give rise to unwanted distortions in markets and behaviour. These modes are important to Ireland's economy, and care should be taken on the emissions cap limits, and on permit distribution. A defensible (though perhaps cynical) position is to support the work going on in ICAO and IMO on this and urge its accelerated completion.

Conclusion

Unfortunately, a recession is a sure way to reduce emissions. But this is hardly a sustainable policy recommendation. As a starting point, a price for carbon needs to be included in appraisals. This will allow better analysis and prioritisation. Another long-standing need is for better data on travel, and if a household travel survey could survive the budget cuts, it would be a very valuable source of data.

But many traditional policy measures still need to be carried out. There are relatively small and inexpensive measures that can make a difference. These measures can deliver useful reductions and, if supported by strong efforts on vehicles and collective efforts across society and the sector, can even turn transport emissions growth around. This would already be a major achievement, as large reductions from the sector do not seem politically or economically feasible by 2020.

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