EXECUTIVE SUMMARY

In October 1973, an embargo by several Middle Eastern countries caused oil supply shortages for several months in most IEA countries and many other countries around the world. Since then, disruptions affecting world oil supply and prices have occurred fairly regularly, averaging two to three significant episodes per decade. In each instance, supplies of retail fuel have gone into shortage in one or more countries and oil prices have risen rapidly and substantially.

To offset a large oil supply disruption, the IEA and its member countries have an important tool: emergency stocks and associated stock draw. In addition to this powerful measure, oil demand restraint measures in transport can be useful. The transport sector accounts for over half of oil use in IEA countries and is expected to account for nearly all future growth in oil use. This book explores measures to rapidly reduce oil demand in the passenger transport sector, over short periods of time.

Application of transportation "demand restraint" policies have increasingly been used by cities around the world to quickly reduce air pollution levels during periods of unacceptably bad air quality; a similar approach may also be useful in the event of oil supply disruptions or during periods of high oil prices. Some measures may also be attractive to cut oil demand over longer periods of time – for example during extended periods of high oil prices, to relieve demand pressure on the market or to rapidly cut the use of an expensive fuel. This is particularly true for measures that can reduce fuel use at low cost, while preserving mobility options. This book emphasises that there are important differences between measures that simply restrict travel, such as driving bans, and those that assist motorists to rapidly cut fuel use, such as promoting "ecodriving" and facilitating car-pooling.

Background and approach

There have been many previous studies of options to reduce oil use in transport. Usually such studies evaluate a range of policy options used under normal circumstances to manage transport fuel demand (or demand for transport itself) in order to reduce long-term growth and/or environmental impacts. While such analysis is very important, and the IEA urges all countries to pursue strategies for reducing oil use over the medium and long term, the analysis presented here differs in an important respect. It focuses on a much shorter time frame: the circumstances of a temporary oil supply disruption that may result in physical shortages of oil or a sudden severe price spike. As we show, this difference in time frame and circumstance can result in a quite different type of analysis, with different results, than in many previous longer-term studies.

Why should governments intervene?

Why should governments intervene to cut oil demand during a supply disruption? One obvious reason is to conserve fuel that might be in short supply. A rapid demand response can also send a strong market signal. In the case of a moderate reduction in oil supplies, a reduction in IEA transport fuel demand of even a few percent could have a substantial dampening effect on surging world oil prices. Achieving even this much reduction in transport energy use would be challenging but, if successful, the value to IEA and other oil-importing countries in terms of maintaining adequate supplies and moderating oil price spikes could be far greater than the costs associated with the measures themselves.

Of course, a supply disruption that induces a rise in oil prices will generate its own response from drivers and other travellers. However, short-term transport demand response to changes in fuel price is notoriously slow and small (*i.e.* there is a low "price elasticity" of demand). If governments can provide better travel alternatives and other incentives to rapidly cut the most energy-intensive types of travel (such as driving alone) during supply disruptions, the response rate might be much higher and the disruption-related costs to society much lower.

Some measures that may not be attractive as general transport demand policies may be more effective in the context of an oil supply disruption. A number of new measures emerge that have not previously received much attention. Some otherwise costly measures appear to become less expensive if implemented over a short period of time, provided governments have taken the necessary preparatory steps to be ready to act on short notice. Several measures are likely to be more socially and politically acceptable, and therefore easier to implement, during an emergency than under normal circumstances. On the other hand, some of the measures discussed in this volume would make perfect sense as part of a more general transport oil demand management strategy. There is certainly some overlap between the two contexts.

Assessing impacts of measures under emergency conditions

There are several ways in which behaviour under conditions of oil supply shortage may differ from behaviour under normal circumstances. For example, the immediate public reaction to a drop in fuel supplies may be panic and hoarding behaviour. In such cases, demand may increase even with a sharp increase in prices. During such a situation, it may be important to manage oil supplies very tightly – for example through an oil allocation scheme. However, as rationing is rarely an economically efficient solution, once the situation is under control, governments should generally try to move quickly to approaches that are likely to be less costly to society. A major cost associated with a fuel shortage that is not solved by rationing is lost mobility – and the lost economic activity that results. If societal mobility can be maintained (*e.g.* through increased car-pooling), and/or if good alternatives to mobility can be provided (such as telecommuting) so that economic activities can continue, this will yield a much better societal outcome than through rationing-oriented solutions.

An important finding of this book is that pre-planning is essential in order for transport demand restraint measures to succeed during an emergency. It is not enough for countries to have a list of measures to use; they must be ready to implement those measures on very short notice. To do this, they generally must develop detailed plans and make certain investments ahead of time. Communicating this plan to the public also appears very important; if the public is not well informed of plans ahead of time, and supportive of them, they may be less likely to co-operate and do their part to help the plans succeed during an emergency. Strong support and co-operation from the business community is also essential. In general, providing clear information to the public – that the public can trust – seems to be an important element of any plan. The role of information is stressed throughout the analysis of measures in this book.

Once measures are put in place that provide fuel-efficient mobility options or alternatives to travel, the public responsiveness to these measures may actually be better during an emergency than under normal circumstances, since there will likely be a strong interest in such alternatives. There may also be an altruistic attitude amongst people to "do their part" during the emergency. If this occurs, then estimates of policy response and impacts based on behaviour during normal circumstances, as made throughout this analysis, may underestimate the impacts of measures during emergencies. But the relative impacts and costs of different measures should at least be similar.

Scope and approach of the study

The analysis presented in this report covers measures affecting road transport (including public transit). It focuses primarily on urban passenger travel, though in a couple of the assessed measures, such as speed limit reductions on motorways, trucks are also affected. There may also be important opportunities to save oil quickly in other transport sectors and modes, such as air travel, shipping, etc., and these should be investigated as well. But this study focuses primarily on road passenger transport because it appears to have some particularly promising opportunities to save oil quickly, and because relatively good information is available upon which to build an analysis.

Most measures considered here are focused on urban or metropolitan areas and therefore not typically applied at a national level (such as increasing public transit service). However, national governments are best positioned to launch a comprehensive programme for dealing with emergency situations, which could include creating incentives and working with cities and regional governments to establish similar programmes around the country.

The basic approach has been to evaluate the impact of a variety of measures if applied individually during an emergency, given the necessary planning and preparation before an emergency occurs. In most cases the measures have the effect of reducing private vehicle travel, either by reducing travel demand or encouraging shifts to public transit or other modes. The following general approaches were evaluated:

- Increases in public transit usage
- Increases in car-pooling
- Telecommuting (working at home)

- Changes in work schedules
- Driving bans and restrictions
- Speed limit reductions
- Information on "ecodriving" (*e.g.* driving style, tyre inflation)

Although most of these measures can also be used for more general transportation demand management, here they are assessed only in the context of temporary use during an emergency. Within each of these approaches several more specific measures were identified and evaluated. A representative measure was then selected with a "consensus" estimate of the likely effect. For example, for car-pooling, measures are assessed ranging from a simple policy of a public campaign calling on people to car-pool more, to actual improvements in car-pooling infrastructure (before an emergency occurs) and requirements that during the emergency cars carry more than one person on certain roads or for certain types of trips. Clearly, such a range of policy approaches can lead to a wide range of possible outcomes. We have provided estimates for many of these. In addition, for each policy type we have provided a consensus estimate based upon our judgment of most likely impacts.

Though driving bans are covered here, there are other types of rationing schemes that this analysis does not address, such as fuel allocation coupon systems. These types of measures may be needed, but should be seen as something of a last resort. Measures to reduce oil demand voluntarily appear likely to incur lower costs on society than simply restricting the supply of motor fuel. However, measures to reduce fuel "hoarding" and similar behaviours may provide an important complement to measures described here.

Policies aimed at changing the price of road transport, either through increased fuel taxes or road charging (toll fees), are discussed but not explicitly scored in terms of impacts. These types of policies, while capable of yielding reductions in fuel consumption, could be difficult to implement during a short-term emergency when fuel costs already may be rising rapidly. Oil price increases will likely have some (though perhaps small) dampening effect on transportation fuel demand, and help to spur the types of travel changes that this report focuses on, such as increased use of public transit, car-pooling and telecommuting. Therefore, perhaps the main price-related issue for policy-makers during a fuel supply disruption is to avoid bowing to pressure to lower existing fuel tax or road charging regimes, so that pricing signals are not distorted. In any case, the measures we focus on involve providing travellers with better information and alternatives to driving (especially to driving alone), so that their ability to respond to and cope with an oil emergency improves. Increased demand responsiveness reduces the negative economic impacts of a supply disruption.

In Chapter 2, estimates of the effects of different measures on oil demand are made for four IEA regions (Japan/Republic of Korea, IEA Europe, USA/Canada and Australia/New Zealand) and then summed over the whole IEA. Wherever possible, sources and data are used for specific countries within each region and aggregated to regional totals, with specific assumptions outlined for each measure. However, though this analysis is based upon existing estimates within the literature, there is a severe shortage of data covering the application of measures during emergency situations. Nor is there much quantitative evidence of how behaviour (such as responsiveness to policies) changes during an emergency. The transport literature generally analyses the longer-term effects associated with various policies under normal fuel supply conditions. Therefore, judgment has been used to estimate behaviour and responses to policies in such situations.

In some cases where data were not available, estimates from similar countries or regions have been used. The year 2001 was used as a "base year" for most calculations, since this was the most recent year for which enough data could be obtained to carry out detailed calculations. Though the amounts of driving and fuel consumption have changed since then, the relative impacts of different measures and the estimated percentage reductions should remain similar, for many years, to the results shown here. Much of the data used in the analysis is provided in tables throughout the report and in the appendix, in an effort to provide countries with much of the data they will need to conduct their own analyses.

Summary of results

A summary of our results, summed and averaged across all IEA countries, is shown in Table E-1. This table provides a brief overview of the types of strategies and the policy context needed to achieve these reductions. These estimates carry

Table E-1

Summary of oil-saving effects of measures summed across all IEA countries

Potential oil savings by category if implemented in all IEA countries	Measure
VERY LARGE More than one million barrels per day	**Car-pooling:** large programme to designate emergency car-pool lanes along all motorways, designate park-and-ride lots, inform public and match riders
	Driving ban: odd/even licence plate scheme. Provide police enforcement, appropriate information and signage
LARGE More than 500 thousand barrels per day	**Speed limits:** reduce highway speed limits to 90 kph. Provide police enforcement or speed cameras, appropriate information and signage
	Transit: free public transit (set fares to zero)
	Telecommuting: large programme, including active participation of businesses, public information on benefits of telecommuting, minor investments in needed infrastructure to facilitate
	Compressed work week (fewer but longer workdays): programme with employer participation and public information campaign
	Driving ban: 1 in 10 days based on licence plate, with police enforcement and signage
	"Ecodriving" (efficient driving styles and vehicle maintenance steps): intensive public information programme
MODERATE More than 100 thousand barrels per day	**Transit fare reduction:** 50% reduction in current public transit fares **Transit service increase:** increase weekend and off-peak transit service and increase peak service frequency by 10% **Car-pooling:** small programme to inform public, match riders
SMALL Less than 100 thousand barrels per day	**Bus priority:** convert all existing car-pool and bus lanes to 24-hour bus priority usage and convert some other lanes to bus-only lanes

a range of uncertainty in terms of the absolute value of the reductions which may be achieved. However, the orders of magnitude and relative effects between policies appear reasonable. The policy strategies shown are to a large degree mutually exclusive. Potential combinations of these measures have not been assessed. Clearly, a combined package of policies could increase the impacts compared to just one, but probably would not have an effect equal to the sum of these policies – since, for example, one person cannot both car-pool and telecommute on the same day. A proper analysis of mutual exclusivities and synergistic effects would require developing a detailed travel demand model and is beyond the scope of the methods used here to estimate these savings. However, more detailed approaches might be appropriate for individual countries – and are commonly available for large cities.

As shown in Table E-1, there is a large range of estimated effectiveness based upon both the specific strategy selected and the policy context in which it is pursued. In general, there are two types of policy approaches. One is focused on providing people with better (and less energy-intensive) travel options to allow them to save fuel, as well as allowing them to avoid the consequences of not being able to purchase fuel. These options tend to focus on providing people with more choices, such as better or cheaper public transit, car-pooling options, telecommuting, flexible work schedules, or promotion of "ecodriving" (efficient driving styles and vehicle maintenance steps). The other policy approach is more prohibitive in nature, essentially restricting travel options or requiring shifts in behaviour. These include driving bans, mandatory car-pooling, speed limit reductions or changes in work schedules. Not surprisingly, the more restrictive options tend to result in greater estimated reductions in fuel consumption, but may also be more expensive to society and unpopular and therefore less politically feasible.

Our main conclusions on those policies which can be most effective are as follows:

- **Restrictions on driving**, such as odd/even-day driving bans, can potentially provide very large savings. However, they may be unpopular and restrict mobility much more than some other measures. Multiple-vehicle households tend to be less affected by this type of policy and therefore this option may be seen as less equitable than some others. If conducted over longer periods, the effectiveness of such policies may decline as travellers figure out ways around the regulations.
- **Measures to increase car-pooling**, if successful, can provide rapid, large reductions in oil demand. But success may be very dependent on the level of incentives given to drivers, which could make this option quite costly. Restrictive options that require car-pooling (such as restricting certain traffic lanes to car-pools) are likely to be most effective but may be seen as inequitable, unless fairly limited in application. Programmes focused only on provision of information (such as setting up a web site to help potential car-poolers find other car-poolers) will likely be more popular, if less effective.

- **Reducing speed limits** on motorways can be very effective for saving fuel, since cars and trucks use much more fuel per kilometre as speeds increase above 90 kilometres per hour (about 55 mph). However, success depends on an adequate enforcement regime. In some cases better enforcement of existing speed limits may be sufficient to lower average speeds significantly. Clear information to the public regarding the strong links between lower speeds and fuel savings may help increase compliance during an emergency. An infrastructure allowing a rapid change to posted speed limits (such as variable speed limit signs) must be put in place ahead of time.

These types of policies, requiring some coercion or restriction on behaviour, may be more acceptable to the public during emergency situations than otherwise, if a sense of the need for common sacrifice is prevalent. In any case, popularity is likely to be fairly low.

In contrast, policies that provide mobility options, such as making it easier for people to use "alternative" modes (*i.e.* alternative to single-occupant vehicles), are likely to be popular, but have a range of effectiveness depending upon the measure and level of investment made. Some require significant investments in order to be prepared before an emergency occurs, so that implementation during an emergency can be achieved on a very short time scale.

- **Temporarily eliminating public transit fares** (*e.g.* if the lost transit revenues are covered out of general tax revenues) appears moderately effective, but would likely be relatively costly per barrel of oil saved. There would also be a large (and inefficient) windfall to existing riders. However, it may help increase the effectiveness and acceptance of other options such as driving bans.

- **Increasing transit service** can provide significant fuel savings (since this can cut car usage as travellers switch modes). However, for short-term increases using existing equipment and personnel, only a small expansion in services appears possible (*e.g.* peak hour services can be increased by perhaps 10% for most systems and peak services can be extended for longer time periods). Temporarily creating new bus-only lanes (or bus and car-pool-only lanes) by converting regular lanes can help, as can extending the operating hours of existing bus-only lanes.

A third set of policies can best be considered "no regret" policies. That is, they are likely to be relatively cheap to implement, mainly requiring a good public information campaign with some related support such as development of websites or other outreach programmes. While in some cases these will provide only modest oil savings, for an aggressive (and successful) programme the fuel savings could be quite large – up to one million barrels a day across all IEA countries. Public support for these measures is likely to be fairly good. Thus, these might be good measures to implement any time, on a permanent basis, though their impacts may be highest in an emergency situation, when the public is most likely to be responsive.

- **Telecommuting and flexible work schedules** can save substantial fuel and potentially be implemented very quickly. A well organised "emergency telecommuting" programme, particularly one where employers agree in advance to participate and designate certain employees to telecommute during designated situations, could yield large reductions in fuel use on such days. This type of plan could extend to other transportation-related emergencies, such as air quality "code red" days, transit strikes, etc.
- **Ecodriving** includes a wide array of behavioural changes, such as more efficient driving styles (*e.g.* changes in acceleration/deceleration and gear shifting patterns), optimal tyre inflation, reducing vehicle weight and other steps. An aggressive and comprehensive public information campaign on the benefits of "ecodriving" could yield substantial fuel savings. While some countries already run information campaigns of this type, at least occasionally, much stronger efforts could generate much better compliance, especially during emergencies.

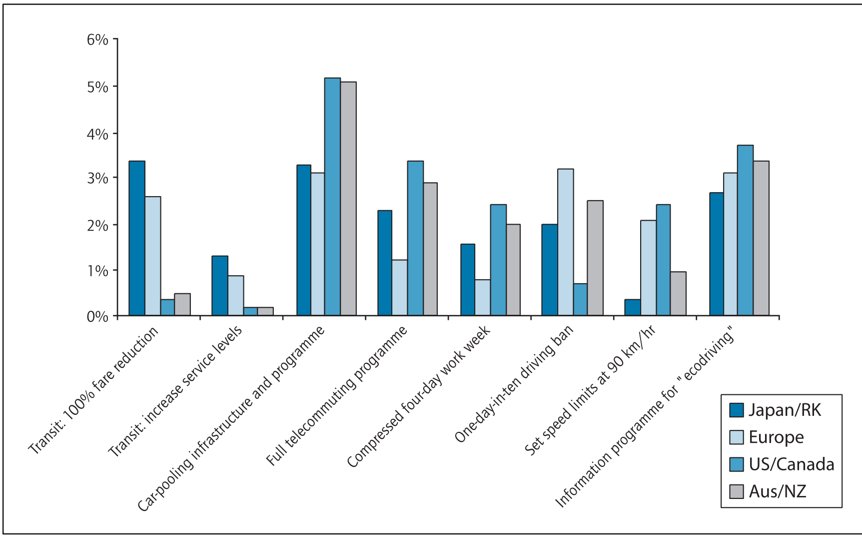
Some other measures, such as switching to alternative fuels and improving new car fuel economy, were judged unlikely to have much impact in an emergency situation, when only very rapid reductions are useful. Measures in these areas may be very important over the medium and longer term, however, in order to lower the trend in transport oil use.

Regional differences

The estimated effectiveness of the different measures varies significantly between IEA regions. This is mainly due to variations in the transport sector in terms of mode shares and the resulting flexibility of travellers to change modes in each region. Figure ES-1 shows results for each region, for selected measures, as a percentage reduction in total petroleum fuel use for that region.

Figure E-1

Percentage reduction in total petroleum fuel use by IEA region, for selected measures



One example of the difference in the flexibility of the current systems is in the level of public transit infrastructure. IEA Europe and Japan/Republic of Korea (RK) tend to have greater levels of public transit and lower car ownership levels compared to North America and Australia/New Zealand (NZ). As a result, the measures to increase transit ridership result in significantly larger percentage reductions in petroleum use in Europe and Japan/RK relative to the other two regions.

On the other hand, car-pooling policies appear less effective in Europe and most effective in North America and Australia/NZ, where levels of solo driving are relatively higher (allowing a greater benefit from increased car-pooling).

The potential of telecommuting and flexible work policies also is least effective in the European region, relative to other regions. This is due to relatively lower current levels of solo car driving for commute trips. Thus, the benefit of a telecommuting or flexible work schedule policy is relatively greater in those countries that currently have more solo car commute trips.

On the other hand, driving bans appear most effective in Europe and least effective in North America. This is a function of the relative levels of household car ownership in each region. Average car ownership per household is highest in North America, which means that households are more likely to have at least one car available on any given day that a driving ban is enforced (as these are usually set by licence plate number).

Speed limit reduction and enforcement policies appear most effective in Europe and North America, where there is relatively higher motorway usage (relative to Japan/RK and Australia/NZ) and (in the case of Europe) higher maximum speed limits, providing more benefit from a reduction. Europe's results would be even higher except that we assume that all heavy trucks already travel at 90 kph, in accordance with EU law. Another fuel economy-related measure, "ecodriving" (campaigns to promote more efficient driving styles and vehicle maintenance), is assumed to have very similar levels of effectiveness across regions.

Implementation costs and cost-effectiveness

The costs associated with implementing each measure, and its cost-effectiveness on this basis, were also estimated. These are summarised in Table E-2, shown as an average cost per barrel of oil saved across the IEA and grouped in order of decreasing cost-effectiveness. (Separate cost estimates were also made by region and are shown in Chapter 3.) It is important to be clear that these results are based on relatively simple assumptions and are incomplete: they include only the direct costs incurred (mostly by governments) to plan for and carry out emergency measures. They do not include most costs or savings to travellers, such as for taking public transit or buying fuel (though fuel costs are included implicitly, since the costs are presented per barrel saved; therefore large fuel savings to consumers are the basis for a low cost-per-barrel estimate). The estimates also do not include many difficult-to-measure but important indirect costs and benefits, such as reduced or enhanced mobility, impacts on travel time (*e.g.* increases in travel time from lower speed limits) and safety (*e.g.* reductions in accidents and fatalities from reductions in speed limits). However, for those measures likely to have a significant impact in one of these areas, this is noted in the third

Table E-2

Summary of implementation cost-effectiveness of various measures

Implementation cost-effectiveness	Measure	Other potential impacts	Oil savings (from Table E-1)
VERY LOW COST Less than $1 per barrel saved	**Car-pooling:** large programme to designate emergency car-pool lanes along all motorways, designate park-and-ride lots, inform public and match riders		Very Large
	Driving ban: odd/even licence plate scheme. Provide police enforcement, appropriate information and signage	Possibly high societal costs from restricted travel	Very Large
	Telecommuting: large programme, including active participation of businesses, public information on benefits of telecommuting, minor investments in needed infrastructure to facilitate	Possible productivity impacts from changes in work patterns	Large
	Compressed work week (fewer but longer workdays): programme with employer participation and public information campaign		Large
	"Ecodriving" (efficient driving styles and vehicle maintenance steps): intensive public information programme	Likely safety benefits	Large
	Car-pooling: small programme to inform public, match riders		Moderate
LOW COST Less than $15 per barrel saved	**Speed limits:** reduce highway speed limits to 90 kph. Provide police enforcement or speed cameras, appropriate information and signage	Safety benefits but time costs	Large
	Driving ban: 1 in 10 days based on licence plate, with police enforcement and signage	Possibly high societal costs from restricted travel	Large
MODERATE COST Less than $50 per barrel saved	**Bus priority:** convert all existing car-pool and bus lanes to 24-hour bus priority usage and convert other lanes to bus-only lanes		Small
HIGH COST More than $100 per bbl saved*	**Telecommuting:** Large programme with purchase of computers for 50% of participants	Possible productivity impacts from changes in work patterns	Large
	Transit: free public transit (set fares to zero); 50% fare reduction, similar cost		Moderate
	Transit: increase weekend and off-peak transit service and increase peak service frequency by 10%		Moderate

* Note: no measures are estimated to cost between $50 and $100 per barrel saved.

column of Table E-2. Measures that are likely to have large indirect costs from restrictions on mobility are also likely to be relatively unpopular, making them more difficult to implement.

Another cost that is hard to measure is macroeconomic in nature. If application of one or more of these measures successfully reduces world oil demand sufficiently to result in a reduction in oil prices, this will yield macroeconomic benefits (or help avoid macroeconomic costs). Such impacts are very difficult to measure, but potentially quite large.

Thus, the estimation of costs associated with different measures is quite complex and is a subject that deserves a more detailed treatment than could be provided in this study. The cost estimates presented here may be most relevant for governments to understand how much various measures will cost them to implement. Even then, the specific costs of implementing a measure may be highly variable and subject to specific conditions and assumptions, and governments are urged to undertake their own detailed cost assessments.

The implementation cost-effectiveness of these assessed measures depends upon many factors, especially the amount of upfront investment made to implement them. In general, those policies that require significant investments or financial outlays are not likely to be cost-effective (roughly defined here as above $50 per barrel of petroleum saved, though there are none between $50 and $100). Those policies that are not cost-effective include decreasing public transit fares, increasing public transit service frequency, constructing car-pool lanes and purchasing home computers for half of all telecommuters. All of these involve substantial costs and their cost-effectiveness (*i.e.* more than $100 per barrel of oil saved) is likely to exceed any expected increase in the cost of oil during an emergency situation.

Those policies that are most cost-effective, with implementation costs less than $50 per barrel saved – and some much less – include information programmes to promote telecommuting and flexible work schedules, "ecodriving", car-pooling, odd/even day driving bans, and in some cases, speed reduction policies. Restriping of existing roadway lanes to create car-pool-only or bus-only lanes is moderately cost-effective, but significantly higher-cost than most of the policies focused on information campaigns. Odd/even day driving bans appear particularly cost-effective over a short period, despite costs associated with enforcing the bans. However, driving bans in particular may impose large indirect costs in terms of lost mobility. As mentioned, such losses are difficult to measure and no attempt has been made to do so here. In contrast, measures that provide more and/or better mobility options clearly provide benefits in this regard.

Conclusions and recommendations

There are a variety of potential policies and measures available to rapidly reduce oil demand in the transport sector. Some of these may make sense at any time, but might be easier to implement, be more effective, or be more cost-effective during an emergency situation such as an oil supply disruption. Though the effectiveness of each measure during an emergency is fairly uncertain and dependent on local circumstances, the available evidence suggests that some have the potential to significantly cut oil demand at a modest implementation cost. Savings on the order of one million barrels per day or more, on an IEA-wide basis, appear possible from well-conducted demand restraint programmes. This is enough to offset a fairly large reduction in world oil supplies.

This study represents one of the few recent, comprehensive efforts to identify and evaluate rapid "demand restraint" measures for transport. More work is needed to continue to improve our understanding in this area. Perhaps most important is for countries to conduct their own analyses, reflecting their own priorities and their national and local circumstances. This study provides methodologies and data that will hopefully be useful in that context.

Even lacking a precise understanding of all the issues related to this topic, it is important that IEA members and other countries have in place plans to respond to episodes of oil supply disruption, in much the same way as many now have systems for responding to periods of particularly bad air pollution. It is important to develop a careful, detailed plan, with public awareness and participation in order to help ensure that citizens will understand and accept the measures when actually implemented. It is also important that those measures with actions that must be taken in advance, in order to prepare for a possible emergency, are identified and the necessary pre-planning undertaken. For nearly every measure assessed in this report, some types of pre-planning and investments are required, without which the measure will likely be much less effective when actually implemented during an emergency.

Finally, when emergency episodes occur in the future, governments should carefully monitor their efforts and assess the effectiveness of their programmes, and share this information so that countries around the world continue to improve their approach and handling of such situations.