The Impact of Including the Road Transport Sector in the EU ETS

A report for the European Climate Foundation

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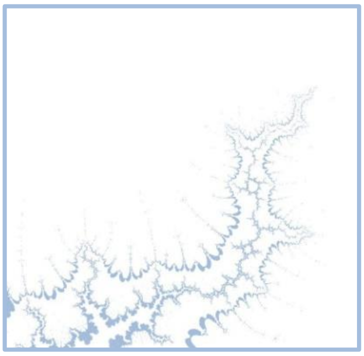

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1 Introduction

The EU Emissions Trading System (EU ETS) is Europe's flagship climate policy. The system covers EU power generation and heavy industry; firms covered by it must purchase allowances to pay for the carbon that they emit. However, the low carbon price in recent years has reduced the incentive for European industry to invest in emission abatement measures. In 2012 the European Commission (EC) published a report titled 'The State of the European Carbon Market in 2012'[1], which suggested several options for reforming the EU ETS to restore the structural balance between supply and demand of allowances and to re-establish the role of the carbon price in encouraging low-carbon investment. One option suggested in the EC's report was to extend the sectoral coverage of the EU ETS. This could, for example, involve the inclusion of emissions from buildings or road transport in the EU ETS.

In light of this suggestion, Cambridge Econometrics was commissioned by the European Climate Foundation to assess the likely effects that including the road transport sector in the EU ETS will have on the price of allowances and the level of road transport emissions.

This short report summarises the main findings from the analysis.

- Section 2 presents our modelling approach and the scenarios that were modelled.
- Section 3 presents the simulation results, including the impacts on the carbon price and on road transport emissions.
- Section 4 draws together conclusions from the analysis, considers key limitations and details the main assumptions applied in our methodological approach.
- There is also a technical appendix which provides more details about E3ME, the model that was used for the analysis.

All prices in the report (carbon prices and fuel prices) are expressed in real terms (2012 price base). Emissions results are presented in tCO_2.

[1] Available online at: http://ec.europa.eu/clima/policies/ets/reform/docs/com_2012_652_en.pdf

2 Modelling Approach

2.1 Modelling energy demand in E3ME

The analysis is carried out using E3ME[2], a macroeconomic model of the global energy system, environment and economy. The structure of E3ME is based on a series of empirically estimated behavioural equations and accounting identities, and includes two-way feedback between each of the three modules (energy, environment and economy). This design makes the model suitable for assessment of the effects of environmental policies on energy demand and emissions. Importantly, E3ME includes a series of energy demand equations (which are estimated for each of the 53 countries, 12 fuel types and 22 energy users defined within the model). The model also includes a macroeconomic module to assess the impact of environmental policy on consumers, industry and the wider economy.

Modelling the road transport sector

E3ME uses the IEA energy balances as the main source for its energy data. This data set includes a breakdown of energy consumption by sector and by energy carrier. Road transport is represented as a single sector within the data as it is not possible to distinguish between sales of motor fuels to different user groups and vehicle types. The analysis in this report therefore corresponds to the road transport sector as a whole.

Modelling the EU ETS

The E3ME model includes a representation of the EU ETS, based on its sectoral coverage (see the manual for further details). The impact of including road transport in the EU ETS (as modelled in E3ME) is dependent on two key factors:

1. The impact of including the road transport sector in the EU ETS on fuel prices.

2. The impact of higher fuel prices on the demand for road transport fuels.

Considering the first of these factors, it is important to note that a high tax rate is already levied on sales of fuel in the road transport sector. Therefore, in percentage terms, carbon costs are unlikely to increase substantially the cost of motor fuels. Figure 1 shows that including the road transport sector in the EU ETS at a carbon price of €10/tCO_2 would increase the current cost of a litre of petrol or diesel in the EU by around 1.5%.

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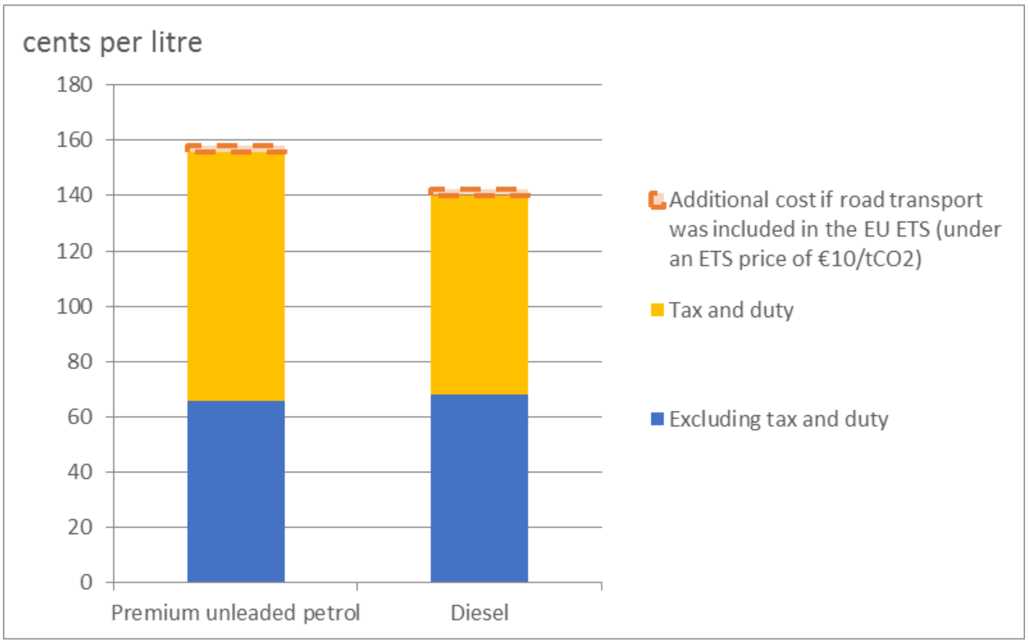
[2] More information about E3ME is available in the appendix. The E3ME manual is available online at www.e3me.com

Figure 1 Average price of petrol and diesel in the EU in September 2014, and the impact on fuel prices if road transport was included in the EU ETS at an ETS price of €10/tCO_2



Source: Petrol and diesel prices taken from the European Commission Oil Bulletin (September 2014)

It is also important to understand the drivers of energy demand in the road transport sector. Price is important, as is the rate of economic activity.[3] E3ME includes both a short-run and a long-run price effect. The short-run price elasticity of demand in the road transport sector is relatively low (Member State elasticities vary between 0.0 and -0.2), reflecting the difficulty in adjusting behaviour, finding alternative means of transport or switching to more fuel-efficient vehicles in the short run. However, in the long run, the price elasticity is much higher at -0.7. This relatively strong behavioural response to prices in the long run occurs as consumers have time to adjust their behaviour by buying more fuel efficient vehicles, reducing usage, or changing the mode of transport that they use. Whilst the short-run price elasticity is econometrically estimated for each country, the long-run price elasticity of -0.7, is used for all countries, and is based on analysis by Franzen and Sterner (1995)[4] and Johansson and Schipper (1997, p.289)[5]. Cambridge Econometrics' own estimation results from cross-sectional regressions based on the E3ME model data have confirmed this result.

Emissions in each sector are calculated by applying emission coefficients to the estimated energy demand results.

[3] Other variables, including a measure of technological change, are also included as explanatory variables in the fuel demand equations.

[4] Franzén, M and T Sterner (1995), 'Long-run Demand Elasticities for Gasoline', in Barker, T., N. Johnstone and P. Ekins (eds.), Global Warming and Energy Elasticities, Routledge.

[5] Johansson, O and L Schipper (1997), 'Measuring the long-run fuel demand of cars', Journal of Transport Economics and Policy, Vol XXXI, No 3, pp 277-292.

The assumptions on vehicle costs in all the scenarios are consistent with those in the 'Fuelling Europe's Future' report.[6] In response to the higher effective price of fuel, we assume that consumers switch to more fuel efficient vehicles, and that this shift leads to an expansion of the motor vehicle supply chain as more energy-efficient technologies are included in new cars. The shift in purchases also leads to an increase in vehicle prices relative to the REF scenario. The expansion of the vehicle supply chain and the associated increase in vehicle prices is modelled as a linear function of road transport emissions abatement in each scenario.

2.2 Scenarios modelled

To assess the impact of including road transport in the EU ETS, we used a scenario-based approach. We modelled four scenarios and compared the results to a reference scenario in which there are no improvements to vehicle efficiency beyond 2015[7]. The key features of each scenario are described below and are summarised in Table 1.

- **REF** – The reference case is used for comparison and is aligned to the PRIMES 2009 baseline projections, in which the 95gCO_2/km target for new vehicles in 2020 (which has now been agreed by law) is not met. This scenario was chosen to provide maximum clarity in order to assess the impact of different policy instruments (including current vehicle efficiency regulation) in the period up to 2030.
- **S0** – A fuel standards scenario in which current CO_2 targets for passenger vehicles are met (95gCO2/km by 2020) and vehicle efficiency regulation is extended, with the average efficiency of new passenger vehicles reaching 60gCO2/km in 2030. This 2030 target is chosen to be broadly in line with modelling in the "Routes to 2050 II" project for the European Commission, which sought to describe credible transport emissions reductions pathways for meeting the economy-wide target described in the Commission's Low Carbon Economy Roadmap[8]. No improvement in efficiency is included for heavy duty vehicles.
- **S1** – A scenario in which there is no fuel efficiency regulation, the road transport sector is included in the EU ETS, and the ETS price is calibrated to match the PRIMES projections.
- **S2** – A scenario in which there is no fuel efficiency regulation, the road transport sector is included in the EU ETS, and the ETS price is assumed to stay low (at €10/tCO_2 over 2020-2030).

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[6] Cambridge Econometrics and Ricardo-AEA (2013), 'Fuelling Europe's Future'. See: http://www.camecon.com/Libraries/Downloadable_Files/Fuelling_Europe_s_Future-_How_auto_innovation_leads_to_EU_jobs.sflb.ashx

[7] Our baseline is calibrated to the Primes 2009 baseline projections, in which average new vehicle efficiency reaches 115gCO_2/km by 2020 and distance travelled increases slightly over the period. However, by taking the same baseline, but assuming no increase in distance travelled per capita, road transport emissions are roughly equivalent to a case in which there is no improvement in vehicle efficiency beyond current levels of 135gCO_2/km.

[8] See: http://www.eutransportghg2050.eu/cms/

- **S3** - A scenario in which there is no fuel efficiency regulation, the road transport sector is included in the EU ETS and the ETS price is calculated within the model, to achieve the same reduction in road transport emissions as that achieved in S0.

Table 1 Summary of scenarios modelled

	Is the road transport sector included in the EU ETS?	Average EU ETS price (2020-2030)	Reduction in road transport emissions over 2015-2030
REF	No	€19.4/tCO_2	-12%
S0	No	€19.4/tCO_2	-33%
S1	Yes	€19.4/tCO_2	Model result
S2	Yes	€10/tCO_2	Model result
S3	Yes	Model result	-32%

Note(s): Prices are expressed in the 2012 price base.

The impact of including road transport in the EU ETS depends crucially on how the cap on emissions would be adjusted. To address this uncertainty, we model three scenarios where the road transport sector is included in the EU ETS. In S1, it is assumed that the carbon price follows the European Commission's official projections, as published in the PRIMES Reference Scenario 2013[9]. In S2, it is assumed that the carbon price remains low, at just €10/tCO_2 over the period 2020-2030 and, in S3, it is assumed that the cap on emissions is tightened, so that the level of abatement in the road transport sector is equivalent to that achieved in S0 (the vehicle regulation scenario).

We do not assume auctioning of the ETS allowances in the road transport sector and instead assume that they are allocated freely, which would be more politically viable in the early stages of implementation. This assumption does not affect the carbon price results, but it would have economic implications, in terms of the profitability of the affected firms and the revenues available to governments.

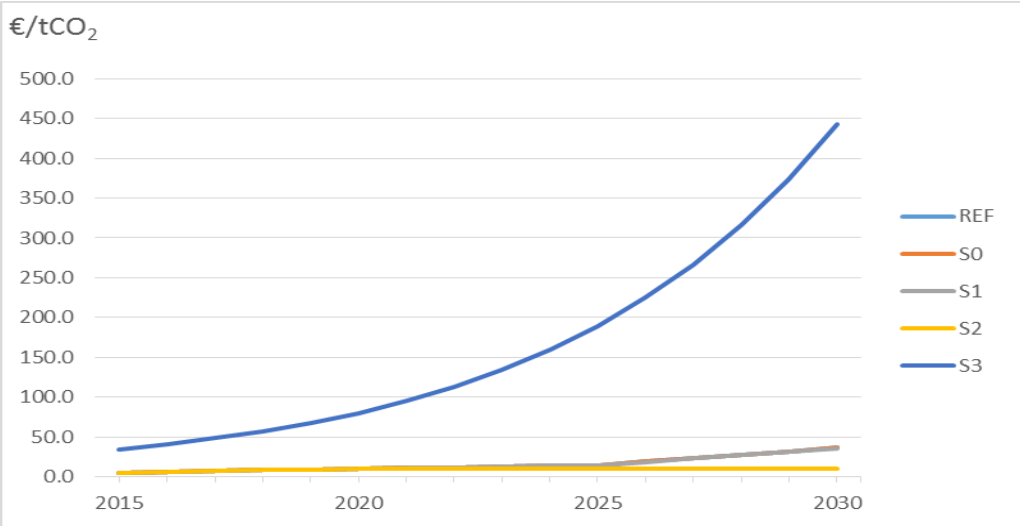
[9] 'EU Energy, Transport and GHG Emissions: Trends to 2050' PRIMES Reference Scenario 2013. See: http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2050_update_2013.pdf

3 Results

3.1 Carbon Prices and Fuel Prices

The carbon prices in the scenarios are shown in Figure 2 and the associated impacts on energy prices are shown in Figure 3. In S3 an average carbon price of €217/tCO_2 over the period 2020-2030[10] is required to achieve the same level of road transport emissions abatement as that achieved in S0.

Figure 2: EU ETS price in each scenario (2012 prices)



Note(s): The EU ETS price is the same in REF, S0 and S1 (calibrated to match the PRIMES projections).

[10] The full effect of the carbon price on road transport energy demand and emissions is only realised in the long run, in which consumers and businesses have time to adjust their behaviour in response to higher prices. Therefore, the carbon price in S3 (reaching €443/tCO_2 in 2030) will drive further reductions in road transport emissions in the post-2030 period. For this reason, we report here the average carbon price over the period 2020-2030, which is a better reflection of the price required to meet the level of road transport emissions reported in 2030.

Figure 3: Average petrol/diesel price in each scenario (2012 prices)

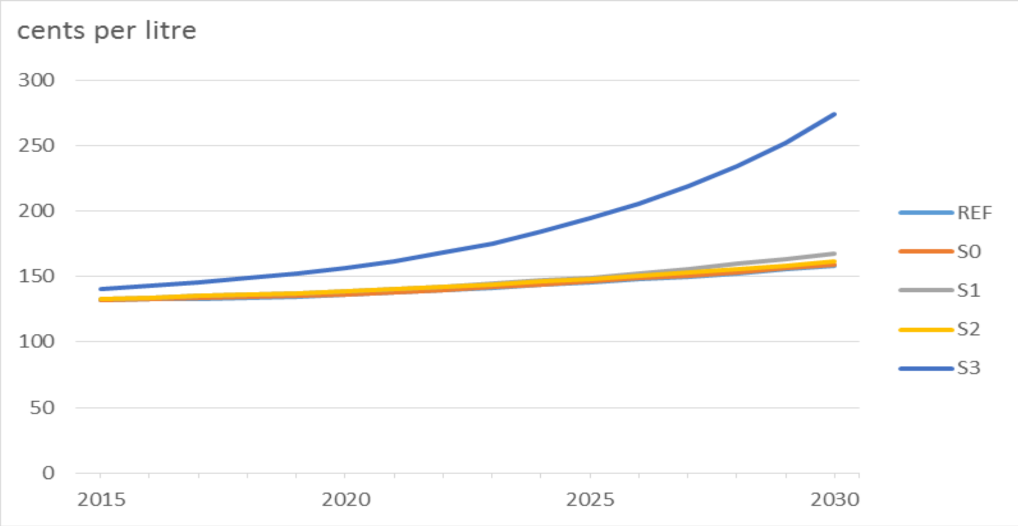


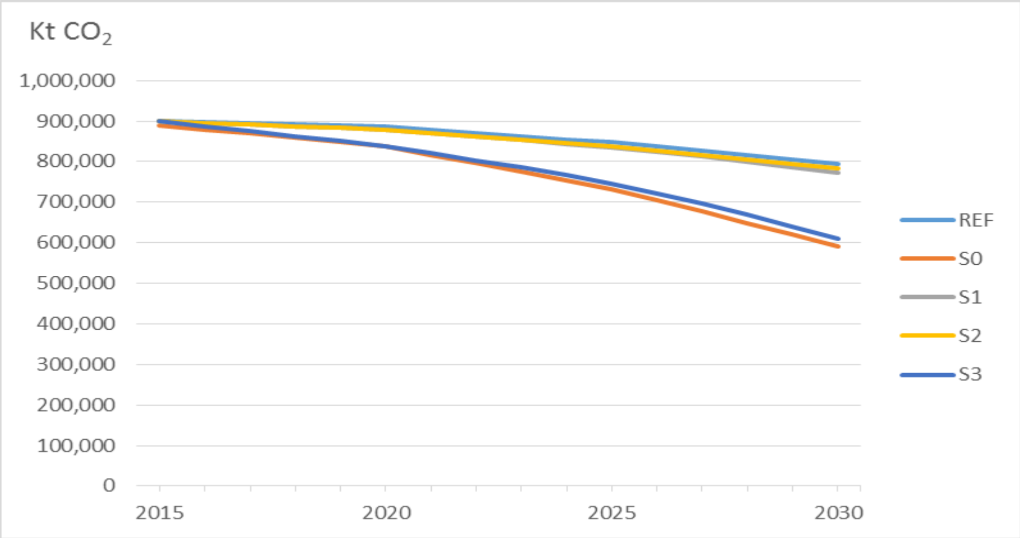
Figure 3 shows that, at current EU ETS price projections, inclusion of the road transport sector in the EU ETS would have only a small effect on fuel prices (as shown in S1 and S2). In S3, an average carbon price of €217/tCO_2 over the period 2020-2030 is required to drive a 38% average increase in fuel prices, relative to REF, that is sufficient to achieve the same level of road transport emissions abatement as in S0.

3.2 Road transport emissions

Figure 4 shows the impact of including road transport in the EU ETS on emissions from the sector. In S1 and S2, the carbon price and fuel prices in the road transport sector are too low to incentivise vehicle users to reduce demand by any substantial amount. In S3, the required road transport emissions abatement is achieved, but at a very high carbon price over the forecast period.

This very high carbon price seems politically infeasible due to the heavy burden it would place on energy-intensive industries and, indirectly, on other industries and consumers. The challenges faced by energy-intensive industries would be substantial and pressure for policy reform would likely be considerable.

Figure 4: CO_2 emissions in the road transport sector



3.3 Economic impact

Analysis in 'Fuelling Europe's Future'[11] shows that, in a scenario similar to S0, fuel standards lead to a reduction in energy demand (and imports of fossil fuels), an expansion of the motor vehicles supply chain and higher vehicle prices. On average, consumers save money on the annual cost of owning and running vehicles, leading to an increase in real incomes and consumption that drivers further increases in employment and GDP.

Including road transport in the EU ETS under current carbon price projections (as shown in S1) has only a very small negative economic impact, as the percentage increase in the price of fuel is minimal (refer to Figure 3). However, this scenario only leads to a small reduction in road transport emissions of around 3% in 2030, relative to the REF scenario.

The carbon price required to achieve the same level of emissions reduction in S3 as in S0 seems infeasible and so we do not report the economic impacts. Although previous analysis using E3ME has shown that at macro level the economic impacts may be small, there would be considerable pressure on firms in the energy-intensive industries.

[11] Cambridge Econometrics and Ricardo AEA (2013), 'Fuelling Europe's Future'. See: http://www.camecon.com/Libraries/Downloadable_Files/Fuelling_Europe_s_Future-_How_auto_innovation_leads_to_EU_jobs.sflb.ashx

Table 2: Scenario results

	Scenario description	Average EU ETS price (2020-2030)	Reduction in road transport emissions in 2030 (relative to REF)
REF	Baseline	€19.4/tCO_2	-
S0	Fuel standards	€19.4/tCO_2	-26%
S1	Road transport included in ETS – current carbon price projections	€19.4/tCO_2	-3%
S2	Road transport included in ETS – low carbon price projections	€10/tCO_2	-1%
S3	Road transport included in ETS – emission	€217.7/tCO_2	-23%

4 Conclusion

4.1 Conclusion

The analysis presented in this report shows that, in order to achieve the level of emissions abatement in the road transport sector required to meet the EU's long-term goals (approximately 60g/km for cars in 2030), an average carbon price of €217/tCO2 would be required over the 2020-2030 period. This level of carbon price would face strong political opposition and seems implausible, as it would create a substantial challenge for the industrial sectors covered by the EU ETS.

In S0, we found that fuel standards on new vehicles can achieve the same level of emissions reduction in the road transport sector as a whole (although concentrated in light-duty vehicles), but at a much lower cost to consumers and industry. The previous 'Fuelling Europe's Future' study showed that consumers would likely benefit due to the lower total cost of vehicle ownership and the economy would benefit from the increase in investment in fuel efficient technologies.

Regulating road transport emissions by means of the ETS alone would result in emissions reductions of only around 1 percent by 2030 at current ETS prices, or of around 3 percent if prices were to rise as projected in PRIMES 2009. This would be insufficient for the road transport sector to contribute proportionately to the EU's stated goals for decarbonisation.

4.2 Limitations of our approach

There are some key assumptions and limitations to our modelling approach that are important to consider when interpreting the results. These are summarized below:

- We do not undertake a bottom-up analysis of the ways in which vehicle owners adapt to the price changes, and therefore, we do not capture the precise details of switching between different modes of transport, for example, from road to rail, or the extent to which the reduction in demand is due to reduced usage, car sharing, modal shifts or buying more fuel efficient cars. The net impact is estimated using one single price elasticity that incorporates all of these effects; therefore the carbon price and emissions results reflect all types of behavioural response, and not just the purchase of more fuel efficient cars. If we had estimated the price required to achieve the same emissions reduction solely due to more fuel efficient vehicles, the carbon price required in S3 would be even higher.
- Relating to the point above, the results are dependent on the fuel price elasticity of demand, which has been estimated using empirical data. One potential limitation of this approach is the Lucas Critique, that suggests that policies themselves may affect behaviour and, as a result, it is inaccurate to assume that observed behaviour in the past is a suitable

reflection of how people will behave (in this case, respond to price changes) in the future.

- Furthermore, the price elasticity is estimated for the road transport as a whole, rather than for cars and vans specifically. Therefore the estimated change in fuel demand due higher prices in road transport, reflects the average behavioural response by owners of private cars, vans, buses and trucks.

Appendices

Appendix A The E3ME Model

A.1 Introduction

Overview

E3ME is a computer-based model of the world's economic and energy systems and the environment. It was originally developed through the European Commission's research framework programmes and is now widely used in Europe and beyond for policy assessment, for forecasting and for research purposes. The global edition is a new version of E3ME which expands the model's geographical coverage from 33 European countries to 53 global regions. It thus incorporates the global capabilities of the previous E3MG model.

Compared to previous model versions, version 6 of E3ME provides:

- better geographical coverage
- better feedbacks between individual European countries and other world economies
- better treatment of international trade with bilateral trade between regions
- a new model of the power sector

This is the most comprehensive model version of E3ME to date and it includes all the features of the previous E3MG model.

Recent applications

Recent applications of E3ME include:

- an assessment of the economic and labour market effects of the EU's Energy Roadmap 2050
- contribution to the EU's Impact Assessment of its 2030 environmental targets
- evaluations of the economic impact of removing fossil fuel subsidies
- an assessment of the potential for green jobs in Europe
- an economic evaluation for the EU Impact Assessment of the Energy Efficiency Directive

This model description provides a short summary of the E3ME model. For further details, the reader is referred to the full model manual available online from www.e3me.com.

A.2 E3ME's basic structure and data

The structure of E3ME is based on the system of national accounts, with further linkages to energy demand and environmental emissions. The labour market is also covered in detail, including both voluntary and involuntary unemployment. In total there are 33 sets of econometrically estimated equations, also including the components of GDP (consumption, investment, international trade), prices, energy demand and materials demand. Each equation set is disaggregated by country and by sector.

E3ME's historical database covers the period 1970-2012 and the model projects forward annually to 2050. The main data sources for European countries are Eurostat and the IEA, supplemented by the OECD's STAN database and other sources where appropriate. For regions outside Europe, additional sources for data include the UN, OECD, World Bank, IMF, ILO and national statistics. Gaps in the data are estimated using customised software algorithms.

A.4 The main dimensions of the model

The main dimensions of E3ME are:

- 53 countries – all major world economies, the EU28 and candidate countries plus other countries' economies grouped
- 69 industry sectors, based on standard international classifications
- 43 categories of household expenditure
- 22 different users of 12 different fuel types
- 14 types of air-borne emission (where data are available) including the six greenhouse gases monitored under the Kyoto protocol

The countries and sectors covered by the model are listed at the end of this document.

A.5 Standard outputs from the model

As a general model of the economy, based on the full structure of the national accounts, E3ME is capable of producing a broad range of economic indicators. In addition there is range of energy and environment indicators. The following list provides a summary of the most common model outputs:

- GDP and the aggregate components of GDP (household expenditure, investment, government expenditure and international trade)
- sectoral output and GVA, prices, trade and competitiveness effects
- international trade by sector, origin and destination
- consumer prices and expenditures
- sectoral employment, unemployment, sectoral wage rates and labour supply
- energy demand, by sector and by fuel, energy prices
- CO_2 emissions by sector and by fuel
- other air-borne emissions
- material demands (Europe only at present)

This list is by no means exhaustive and the delivered outputs often depend on the requirements of the specific application. In addition to the sectoral dimension mentioned in the list, all indicators are produced at the national and regional level and annually over the period up to 2050.

A.6 E3ME as an E3 model

The E3 interactions

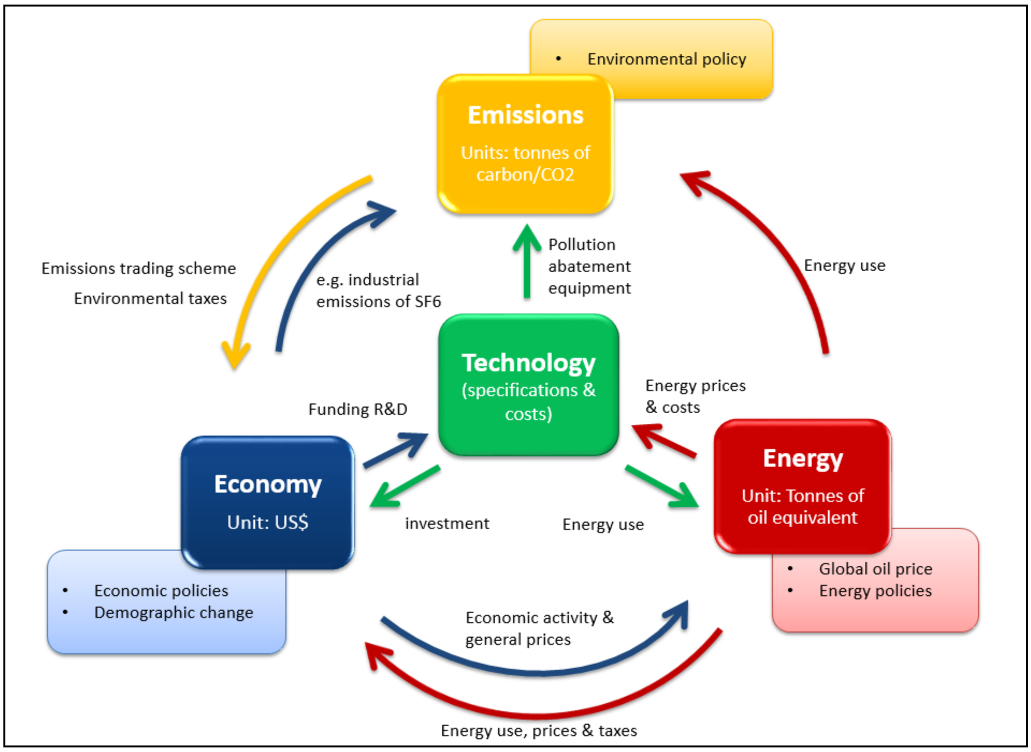
Figure A.1 shows how the three components (modules) of the model - energy, environment and economy - fit together. Each component is shown in its own box. Each data set has been constructed by statistical offices to conform with accounting conventions. Exogenous factors coming from outside the modelling framework are shown on the outside edge of the chart as inputs into each component. For each region's economy the exogenous factors are economic policies (including tax rates, growth in government expenditures, interest rates and exchange rates). For the energy system, the outside factors are the world oil prices and energy policy (including regulation of the energy industries). For the environment component, exogenous factors include policies such as reduction in SO_2 emissions by means of end-of-pipe filters from large combustion plants. The linkages between the components of the model are shown explicitly by the arrows that indicate which values are transmitted between components.

The economy module provides measures of economic activity and general price levels to the energy module; the energy module provides measures of emissions of the main air pollutants to the environment module, which in turn can give measures of damage to health and buildings. The energy module provides detailed price levels for energy carriers distinguished in the economy module and the overall price of energy as well as energy use in the economy.

The role of technology

Technological progress plays an important role in the E3ME model, affecting all three Es: economy, energy and environment. The model's endogenous technical progress indicators (TPIs), a function of R&D and gross investment, appear in nine of E3ME's econometric equation sets including trade, the labour market and prices. Investment and R&D in new technologies also appears in the E3ME's energy and material demand equations to capture energy/resource savings technologies as well as pollution abatement equipment. In addition, E3ME also captures low carbon technologies in the power sector through the FTT power sector model[12].

Figure A.1: CO_2 emissions in the road transport sector



[12] See Mercure, J-F (2012), 'FTT:Power A global model of the power sector with induced technological change and natural resource depletion', Energy Policy, 48, 799–811.

A.7 Treatment of international trade

An important part of the modelling concerns international trade. E3ME solves for detailed bilateral trade between regions (similar to a two-tier Armington model). Trade is modelled in three stages:

- econometric estimation of regions' sectoral import demand
- econometric estimation of regions' bilateral imports from each partner
- forming exports from other regions' import demands

Trade volumes are determined by a combination of economic activity indicators, relative prices and technology.

A.8 The labour market

Treatment of the labour market is an area that distinguishes E3ME from other macroeconomic models. E3ME includes econometric equation sets for employment, average working hours, wage rates and participation rates. The first three of these are disaggregated by economic sector while participation rates are disaggregated by gender and five-year age band.

The labour force is determined by multiplying labour market participation rates by population. Unemployment (including both voluntary and involuntary unemployment) is determined by taking the difference between the labour force and employment. This is typically a key variable of interest for policy makers.

A.9 Comparison with CGE models and econometric specification

E3ME is often compared to Computable General Equilibrium (CGE) models. In many ways the modelling approaches are similar; they are used to answer similar questions and use similar inputs and outputs. However, underlying this there are important theoretical differences between the modelling approaches.

In a typical CGE framework, optimal behaviour is assumed, output is determined by supply-side constraints and prices adjust fully so that all the available capacity is used. In E3ME the determination of output comes from a post-Keynesian framework and it is possible to have spare capacity. The model is more demand-driven and it is not assumed that prices always adjust to market clearing levels.

The differences have important practical implications, as they mean that in E3ME regulation and other policy may lead to increases in output if they are able to draw upon spare economic capacity. This is described in more detail in the model manual.

The econometric specification of E3ME gives the model a strong empirical grounding. E3ME uses a system of error correction, allowing short-term dynamic (or transition) outcomes, moving towards a long-term trend. The dynamic specification is important when considering short and medium-term analysis (e.g. up to 2020) and rebound effects[13], which are included as standard in the model's results.

A.10 Key strengths of E3ME

In summary the key strengths of E3ME are:

- the close integration of the economy, energy systems and the environment, with two-way linkages between each component
- the detailed sectoral disaggregation in the model's classifications, allowing for the analysis of similarly detailed scenarios
- its global coverage, while still allowing for analysis at the national level for large economies
- the econometric approach, which provides a strong empirical basis for the model and means it is not reliant on some of the restrictive assumptions common to CGE models
- the econometric specification of the model, making it suitable for short and medium-term assessment, as well as longer-term trends

Table 1: Main dimensions of the E3ME model

	Regions	**Industries (Europe)**	**Fuel Users**
1	Belgium	Crops, animals, etc	Power use and transformation
2	Denmark	Forestry & logging	Own use and transformation
3	Germany	Fishing	Iron and steel
4	Greece	Coal	Non-ferrous metals
5	Spain	Oil and Gas	Chemicals
6	France	Other mining	Non-metallic minerals
7	Ireland	Food, drink & tobacco	Ore-extraction (non-energy)
8	Italy	Textiles & leather	Food, drink and tobacco
9	Luxembourg	Wood & wood prods	Textiles, clothing & footwear
10	Netherlands	Paper & paper prods	Paper and pulp
11	Austria	Printing & reproduction	Engineering etc
12	Portugal	Coke & ref petroleum	Other industry
13	Finland	Other chemicals	Construction
14	Sweden	Pharmaceuticals	Rail transport
15	UK	Rubber & plastic products	Road transport
16	Czech Rep.	Non-metallic mineral prods	Air transport
17	Estonia	Basic metals	Other transport services
18	Cyprus	Fabricated metal prods	Households
19	Latvia	Computers etc	Agriculture, forestry, etc
20	Lithuania	Electrical equipment	Fishing
21	Hungary	Other machinery/equipment	Other final use
22	Malta	Motor vehicles	Non-energy use

[13] Where an initial increase in efficiency reduces demand, but this is negated in the long run as greater efficiency lowers the relative cost and increases consumption. Barker, T., Dagoumas, A. and Rubin, J. (2008) 'The macroeconomic rebound effect and the world economy', Energy Efficiency.

23	Poland	Other transport equip
24	Slovenia	Furniture; other manufacture
25	Slovakia	Machinery repair/installation
26	Bulgaria	Electricity
27	Romania	Gas, steam & air cond.
28	Norway	Water, treatment & supply
29	Switzerland	Sewerage & waste
30	Iceland	Construction
31	Croatia	Wholesale & retail MV
32	Turkey	Wholesale excl MV
33	Macedonia	Retail excl MV
34	USA	Land transport, pipelines
35	Japan	Water transport
36	Canada	Air transport
37	Australia	Warehousing
38	New Zealand	Postal & courier activities
39	Russian Fed.	Accommodation & food serv
40	Rest of Annex I	Publishing activities
41	China	Motion pic, video, television
42	India	Telecommunications
43	Mexico	Computer programming etc.
44	Brazil	Financial services
45	Argentina	Insurance
46	Colombia	Aux to financial services
47	Rest Latin Am.	Real estate
48	Korea	Imputed rents
49	Taiwan	Legal, account, consult
50	Rest ASEAN	Architectural & engineering
51	OPEC	R&D
52	Indonesia	Advertising
53	Rest of world	Other professional
54		Rental & leasing
55		Employment activities
56		Travel agency
57		Security & investigation, etc
58		Public admin & defence
59		Education
60		Human health activities
61		Residential care
62		Creative, arts, recreational
63		Sports activities
64		Membership orgs
65		Repair comp. & pers. goods
66		Other personal serv.
67		Hholds as employers
68		Extraterritorial orgs
69		Unallocated/Dwellings

Source(s): Cambridge Econometrics.