BELLONA EUROPA brief

Rethinking the cost of conventionally fuelled road transport

Getting the fossil car industry to pay the human health bill

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Road transport: Europe's biggest killer

Poor air quality, largely resulting from conventionally fuelled road transport, is Europe's largest environmental health hazard, claiming thousands of lives each year. **If this heavy human health cost was to be paid by the fossil auto industry, internal combustion engine (ICE) cars would see their sticker price doubling.**

Transport is the only sector in the EU where no significant decline in CO_2 emissions has been observed over the past decades. Its emissions only started to decrease in 2007, and they still remain higher than in 1990.[1] With a nearly total dependence on oil, the vast majority (84%) of which is imported, Europe's transport burns up to

One in three Europeans living in cities today endure air quality deemed illegal under EU air quality standards.

Credit: Think Stock Photos

€1 billion a day and is responsible for a quarter of the EU's total CO_2 emissions.[2]

In addition to its heavy carbon footprint, road transport is to blame for the lion's share of health damaging local air pollution, being the largest

[1] https://ec.europa.eu/clima/policies/transport_en

[2] European Commission, 2017 http://ec.europa.eu/transport/themes/urban/cpt_en

source of NOx emissions (46% of total EU emissions)[3] as well as particulate matter (PM). In an attempt to modestly reduce earth warming-CO_2 emissions, a misguided switch from petrol to diesel was heavily promoted EU-wide back in the 1990s. Over twenty years later, in the wake of the Dieselgate scandal, overwhelming evidence has piled up revealing another not so bright side to diesels: namely their tremendous direct impact on human health through local air pollution. While diesel cars can produce 15% less CO_2 than petrol cars, they emit at least four times more nitrogen dioxide (NO_2) and 22 times more particulates. Systematic fraudulent emission testing practices have helped car makers achieve significant profit, amounting to roughly €7 billion[4], from cheating their way into compliance with EU regulations. The bill has instead been paid by society – in the form of deadly air pollution levels and reduced quality and length of European lives. In fact, in 23 out of 28 EU Member States air quality standards are still exceeded[5]. As a consequence, one in three Europeans living in cities today endure air quality that is illegal under EU air quality standards, and almost all Europeans living in cities are exposed to levels of air pollutants deemed damaging to health by the World Health Organisation's more stringent guidelines.[6] The scale and intransigency of this issue is confirmed in the latest studies by the European Environmental Agency identifying **poor air quality as the single largest environmental health hazard on the continent, resulting in a lower quality of life due to illnesses and an estimated of 467,000 premature deaths per year[7].**

[3] *Air Quality in Europe – 2016 Report*, EEA (November, 2016); http://www.eea.europa.eu/highlights/stronger-measures-needed
[4] *Mind the Gap 2015*, Transport & Environment (September, 2015)
[5] European Commission, 2017 http://europa.eu/rapid/press-release_IP-17-197_en.htm
[6] *Towards clean and smart mobility: EEA Signals 2016*, EEA (2016)
[7] *Air quality in Europe – 2016 report*', EEA (November, 2016)

Factoring human health costs into fossil cars' price tags

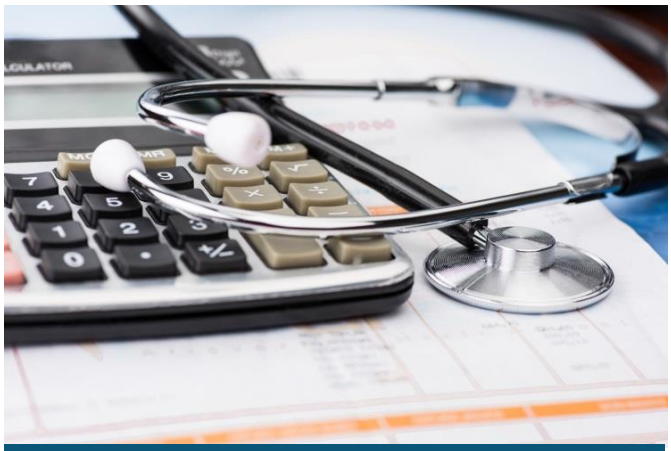
The unaffordable personal and economic cost of air pollution underscores the need for strong policy action on EU and national levels. If the heavy human health costs from exhaust emissions were to be borne by car makers, we estimate that average EU-based conventionally fuelled car would have to pay back €2,371 per year to correctly compensate the public. **In other words, the unaccounted for human health cost of a fossil vehicle during its lifetime would be roughly €23,715,[8] which in turn would result in the doubling of the average ICE car's sticker price to €50,150** (see page 5 for details)**.** Our conclusions are simple: electro-mobility is the only viable cost-effective approach to drastically reducing damaging air pollution while safeguarding human health.

The heavy economic cost of transport-induced air pollution

Nitrogen dioxide (NO_2) and fine particulate matter (PM2.5), the two main air pollutants from road transport, are associated with adverse cardiovascular, respiratory and other effects on mortality, morbidity and well-being[9]. Living near busy roads could be responsible for some 15-30% of all new cases of asthma in children; and for chronic obstructive pulmonary disease and coronary heart disease in adults 65 years of age and older. Heart disease and stroke are the most common reasons for premature death, being responsible for 80% of cases of premature death; followed by lung diseases and lung cancer.[10] What is more recent research has suggested links between neurodegenerative diseases such as

[8] Taking into account the average age of an ICE car in the EU is 9.73 years: http://www.acea.be/statistics/article/average-vehicle-age
[9] Schucht et al (March 2015) "*Moving towards ambitious climate policies: monetized health benefits from improved air quality could offset mitigation costs in Europe*"
[10] *Air Quality in Europe – 2016 Report*, EEA (November, 2016)

Alzheimer's and the high exposure to airborne PM-derived magnetite nanoparticles[11].



The OECD predicts human health costs from transport-related to air pollution could reach up to 2% of EU GDP in 2060.

Credit: Think Stock Photos

While these human health impacts do not have an explicit market value, they carry significant financial and economic implications in terms of increased expenditures on hospital charges, public health spending, reduced labour productivity due to absences from work for illness and pre-mature deaths. **In fact, the European Commission estimated that total health-related external costs in 2013 were in the range of €330–940 billion, including direct economic damages of €15 billion from lost work days, €4 billion from healthcare costs, €3 billion from crop yield loss and €1 billion from damage to buildings.**[12]

The OECD projects that these costs could reach 2% of European GDP in 2060. In addition to placing EU countries at a risk of reduced GDP growth and permanent recessions, this would suck in resources that could otherwise be invested into innovation, education, and low-carbon technologies.

Why hybrids won't save our health and may even worsen it

Increasing awareness of the threat air pollution poses to human health has caused a growing number of European cities to adopt clean mobility policies and initiatives. Paris, Madrid, Athens and Mexico City for instance announced plans of completely banning all diesel vehicles in less than eight years.[13] Norway has announced an end to fossil vehicle sales entirely by 2025[14]. In view of attaining this goal, the Norwegian government has put in place a comprehensive package of fiscal and practical incentives to stimulate the purchase of zero emission pure battery electric vehicles (EVs).[15] Similar incentives have also been made available for the purchase of plug-in hybrids (PHEVs), as a result of which, in 2016, for the first time we observed plug-in hybrid sales (118, 041) exceeding EV sales (91 258)[16]. **The growth in sales of plug in hybrids at the expense of pure battery-powered EVs is alarming, however, since their environmental benefits have been largely exaggerated.** Like EVs, plug-in hybrids have a battery and an electric motor. But as in gasoline vehicles, these also have a gasoline tank and an internal combustion engine (ICE). The Dieselgate scandal has shown that the discrepancy between reported and real-world emissions for hybrids has been even greater than for ICE cars, and may well be even more so for plug-in hybrids. According to the EU's outdated NEDC test, Europe's most popular plug-in hybrid, the Mitsubishi Outlander, produces emissions three times higher than claimed by car makers on paper.[17] The distinction

[11] Maher et al (July 2016) "*Magnetite pollution nanoparticles in the human brain*"; http://www.pnas.org/content/113/39/10797

[12] European Commission Staff Working Document (2013), Impact Assessment – Accompanying the Communication from the EC to the Council, EP, EESC and CoR - a Clean Air Programme

[13] Ban by 2025; http://www.c40.org/blog_posts/daring-cities-make-bold-air-quality-commitment-to-remove-all-diesel-vehicles-by-2025

[14] http://bellona.org/news/fossil-fuels/2016-06-norway-reaffirms-its-leadership-position-with-plans-for-no-fossil-cars-by-2025

[15] *Electric Vehicles: The Norwegian Experience in Overcoming Barriers*, Bellona (March, 2015); http://network.bellona.org/content/uploads/sites/3/Bellona-EV-Brief_The-Norwegian-Success-Story1.pdf

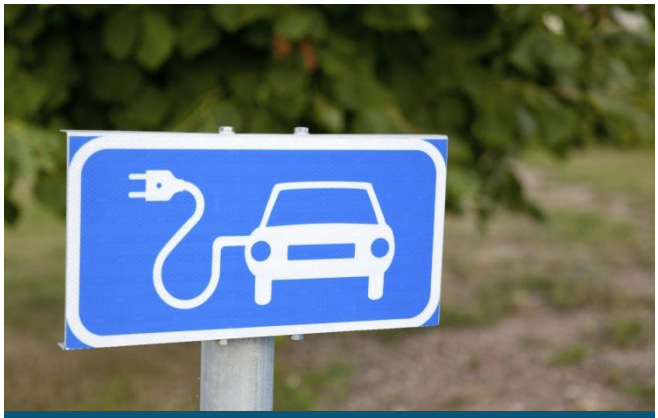
[16] EAFO statistics: http://www.eafo.eu/vehicle-statistics

[17] *Mind the Gap 2015*, Transport & Environment (September, 2015)

in the environmental attributes of EVs versus PHEVs needs to be well reflected in national policies.

Electro-mobility: the cost-effective solution to air pollution

In light of the overwhelming evidence pointing to the conventional car industry's impact on public health, urgent measures are needed to reduce direct emissions from transport. **The wider uptake of electro-mobility offers the only feasible means to making Europe's transport cleaner, quieter, more efficient and much less dependent on costly imported energy.**



EVs emit 20 times less NOx than their ICE counterparts.

Credit: Think Stock Photos

In contrast to ICE cars and PHEVs, EVs produce no exhaust emissions and consequently cause less pollution in general. PM emissions are up to eight times higher for diesel vehicles and at least two times higher for petrol cars. Fossil cars' contribution to mortality and injury are 2.10 times higher than for EVs.[18]

In a Well-to-Wheels perspective, EVs emit 20 times less NOx than ICE cars[19]. **A case study performed on the city of Rome found that even a modest shift of 20% of the fleet to electro-mobility would result in substantial health benefits by reducing the population's exposure to PM_{10} by 30% and to NOx by 45%.**[20] EVs' vastly greater energy efficiency[21] and contribution to tackling air pollution therefore results in substantial health and monetary gains. As an example of similar gains, one study looking at 20 European cities estimates that reductions in sulphur content of fossil transport fuels as a result of compliance with EU legislation has prevented a total of 2,200 premature deaths from ambient SO_2 emissions, which in turn has translated into economic savings worth €192 million.[22]

Fossil cars paying their health bill

Transport is the second largest expenditure item for the average European household, preceded only by housing costs. On average, every person spends €1,900 on transport per year, which represents 13% of their spending. As we now know, following the Dieselgate scandal, car emissions have been significantly higher on the road than claimed on paper by car makers, which in turn has resulted in higher costs for consumers.[23] While true that the costs of owning and maintaining an EV will vary depending on the type of EV model, the electricity used to charge it, the charging patterns, the kilometres driven per day and the price of gas, existing data confirms their lower total cost of ownership. In reality, these savings would be even more significant if the heavy external cost of ICE cars had been reflected in their purchase price; currently human health impacts are not accounted for in ICE vehicles' price tags, and thus not paid by car buyers, but rather by society.

[18] Hooftman et al (2016) *Environmental Analysis of Petrol, Diesel and Electric Passenger Cars in a Belgian Urban Setting*

[19] Mobility, Logistics and Automotive Technology Research Centre, 2017: http://mobi.vub.ac.be/mobi/news/electric-driving-sparking-your-interest/

[20] Aria Technologies 2013

[21] http://network.bellona.org/content/uploads/sites/3/2017/02/E-mobility-platform-Position-Paper-Energy-Union-FINAL.pdf

[22] Hooftman et al (2016) *Environmental Analysis of Petrol, Diesel and Electric Passenger Cars in a Belgian Urban Setting*

[23] http://www.get-real.org/economy/

Putting things into perspective

So what would conventional vehicles' price tags look like if they were to truly reflect their exhaust emissions-related human health costs? Given there are currently 253 million ICE cars on European roads[24], and taking into account the fossil car industry's total annual human health-related economic burden of roughly €600 billion[25], each EU-based ICE car would have to pay back €2,371 per year to correctly compensate the public, and truly reflect its footprint on human health. These unaccounted for human health costs of an ICE car would amount to roughly €23,715 during its lifetime.[26] **If these external costs were to be taken into account this would result in the doubling of ICE cars sticker price to €50,150.**

If car makers were to pay the human health bill, how much would the average ICE car cost?

253 million ICE cars in EU 28 today

€600 billion annually in human health costs from fossil transport-induced air pollution (mid-estimate based on European Commission figures)

€2,371 worth of human health costs per fossil car per year

€23,710 of additional costs in terms of human health per ICE car during its lifetime, taking into account the average age of an ICE car in the EU is 9.73 years

€50,150 would be the average sticker price of an ICE car in the EU: this is double the current average price of €26,436

[24] European Automobile Manufacturers Association, http://www.acea.be/statistics/tag/category/key-figures

[25] This is a mid-estimate based on figures from European Commission Staff Working Document (2013), Impact Assessment – Accompanying the Communication from the EC to the Council, EP, EESC and CoR - a Clean Air Programme

[26] Taking into account the average age of an ICE car in the EU is 9.73 years

Electric vehicles account for roughly 30% of Norway's new passenger car sales.

Credit: Think Stock Photos

Learning from the country where EVs roam free

In recognition of EVs' economic benefits, some governments have adopted policies providing preferential treatment to EV drivers. In Norway, for example, those who purchase an EV are exempted from high rates of purchase tax as well as from VAT. This has an enormous effect, given that in Norway taxes can double or even triple a car's purchase price. Moreover, owners pay no road and ferry tolls and enjoy free parking in public charging spots. They also benefit from more affordable insurance and may re-charge their vehicle for free from thousands of points across the country. Coupled together these fiscal and usage incentives have rendered EV ownership a cost-saving opportunity. In fact, 41% of EV buyers quote 'cost-saving' as the primary reason for buying an EV.[27] As a result, Norway today enjoys the world's highest penetration of EVs per capita, with latest light duty plug-in EV registrations totalling 112,721 (July, 2016).[28] Like the majority of European cities, however, Oslo has

[27] *Evolution: Electric Vehicles in Europe: gearing up for a new phase?* Amsterdam Round Tables and McKinsey & Company (April, 2014)

[28] http://www.hybridcars.com/americans-buy-their-half-millionth-plug-in-car/top-pev-global-markets-july-2016/

also suffered poor air quality problems arising from its still predominantly diesel-powered vehicle fleet. NO_2 emissions, mainly from transport, have been a major contributor to the 185 premature deaths claimed by air pollution in the Norwegian capital each year. **The total economic cost of the premature deaths from air pollution incurred by Norway in 2010 is estimated at €807 million.[29] By comparison, the yearly government spending on EV incentives (direct and indirect) for the whole country has been between €400 and 500 million, roughly half of the estimated yearly human health cost from air pollution.** Enabling the EV revolution in Norway has thus been a cost-effective means to saving human lives and the environment.

Getting EVs on the road and pollution out of the air

The welfare gains of policies aimed at avoiding premature deaths and illness can be very significant. The full and coherent implementation of the EU's existing legislation will be one part of the solution. Much of this legislation, however, is in need of revision, to enhance its ambition and ensure oversight over its implementation.

The stick component

To limit exhaust emissions from passenger vehicles, the EU has put in place the so-called **'Euro standards'** for various air pollutants, including NOx and PM. While these standards have become increasingly stringent over time, the latest being the Euro 6, their effectiveness and trustworthiness has been undermined by the inadequacy of the NEDC regime and its systematic manipulation by car makers. Starting from 1 September 2017 the outdated NEDC will be replaced with the new **Real Driving Emissions (RDE) test**: which will be carried out on the road as opposed to labs, by using portable emission measurement systems to record emissions. Equally important, however, is to ensure the new test is accompanied by the establishment of an **independent and impartial EU-wide type approval authority**. At present, the responsibility for conducting surveillance checks over light duty vehicles and trucks rests with EU Member States. These in turn have often delegated this responsibility to car makers themselves due to limited resources and expertise, or even worse – have granted their own, domestic auto industries preferential treatment as we've recently observed in Italy with Fiat vehicles.

Getting EVs on European roads is key to cleaning our air and safeguarding human lives.

Credit: Think Stock Photos

The creation of an EU body to oversee vehicles' compliance with EU legislation is key to rectifying the conflicts of interest between car makers, national authorities and private labs. Earlier this month the European Parliament's Committee for Emission Measurements in the Automotive Sector (EMIS) called for the creation of such an EU body to oversee vehicle type approval. The April 2017 EP plenary vote in Strasbourg will thus be decisive for paving the way to such an EU authority, and to ending the conventional car industry's privileged position.

[29] *Economic cost of the health impact of air pollution in Europe*, WHO and OECD (2015)

Empowering consumers

The key to effectively internalising the fossil auto industry's costs lies in the signals provided to consumers when prices reflect true costs. Providing transport users with correct price signals would help in initiating efficient behaviour and help to foster the uptake of electric mobility. As a first step, reflecting ICE cars' heavy human health cost in their purchase price would enable consumers and car manufacturers to make informed purchase and investment decisions. Stimulating the supply and demand for zero emission vehicles will necessitate the adoption of appropriate measures at the EU-, national-, and local-levels. **Rendering EVs more attractive to consumers and boosting their demand calls for a combination of fiscal and practical incentives** to be made available: while the exact combination of these will vary depending on the country and its characteristics, these are indispensable in one form or another at least in early stages of EV market development. The potential strain on local authorities' budgets from subsidising EV incentives can be easily mitigated through imposing appropriate taxation on their fossil counterparts. What is more, the need for such incentives will progressively diminish over time as the EV market takes off and batteries continue improving both in terms of performance and cost. Many studies expect that EVs will reach price parity with ICE cars within the next three years. The IEA for instance predicts that by 2020 EV battery costs will have reached EUR 283 kWh: the threshold they deem to render EVs cost-competitive to conventional vehicles. **Overcoming consumer anxieties with regards to range- and charging compatibility is key to incentivise the electric shift**. The Alternative Fuels Infrastructure Directive[30], whose implementation EU countries are currently planning for, offers an important opportunity to address these anxieties. While harmonisation of technologies and charging connectors is key for the EV market to take off, the Directive's implementation needs to leave room for further innovation, so as to allow more advanced charging technologies into the market[31]. The currently ongoing revision of the Energy Performance in Buildings Directive[32], on the other hand offers the opportunity to advance the rollout of EV charge points in the private domain. Daily normal power charging[33] (at the workplace or overnight at home) offers the most convenient charging experience for passenger EVs, and accounts for roughly 90% of the energy charged by an EV during its lifetime. As such, mandating in EU law the buildup of charge points in buildings is key to addressing the majority of EV charging needs. These are only a few of the measures that should be adopted to enable a favorable regulatory environment for the uptake of electro-mobility. **Today's incumbent car industry-induced air pollution and the related human health crisis should serve as a wakeup call for policy makers in Europe and beyond to accelerate this inevitable transition.**

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[30] Directive 2014/94/EU

[31] *Accelerating Electric Recharging Infrastructure Deployment in Europe*, Platform for Electro-Mobility (November, 2016); http://www.platformelectromobility.eu/wp-content/uploads/2016/11/Platform-Position-Paper-Electric-Infrastructure.pdf

[32] EC proposal amending Directive 2010/31/EU on Energy Performance of Buildings; http://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v10.pdf

[33] Normal power charging being from 3.7 to 22kW as defined in Art. 2 (4) of Directive 2014/94/EU

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