

# Storia e Futuro

## A country “up to the neck in cars”: automobiles and the emissions regulation in Italy (1950-2008)

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di Federico Paolini

### Abstract

**Un paese con le “auto alla gola”: l’automobile e la regolamentazione delle emissioni in Italia (1950-2008)** L’automobile non è stata solo un mezzo di trasporto o un prodotto tecnologico in grado di rivoluzionare il trasporto terrestre, ma anche un motore di trasformazione sociale. L’auto non ha modificato solamente la vita quotidiana, ma anche lo spazio fisico. Le modificazioni ambientali indotte dall’automobile hanno posto problemi del tutto nuovi. L’altro lato della motorizzazione, infatti, sono stati gli incredibili ingorghi stradali causati dall’inadeguatezza della rete viaria, i centri storici deturpati dalle auto in sosta, l’inquinamento atmosferico, i danni inferti al paesaggio dalle infrastrutture... Questo saggio si concentra sui problemi ambientali connessi all’inquinamento atmosferico causato dagli autoveicoli e sulla storia della regolamentazione delle emissioni, poiché questo argomento rappresenta un ideale punto di partenza per far dialogare il caso italiano con la storiografia internazionale che si è occupata essenzialmente dei problemi ambientali indotti dai gas di scarico.

### Abstract english

In Italy the car has not only been a means of transport or a product of technology capable of revolutionising land transport, but it has also been the agent of social transformation. The car, however, not only changed daily life, physical space also radically changed: Environmental changes brought about by the car have presented us with entirely new problems. The other side of motorization was the incredible traffic jam caused by the inadequacy of the road system; old town centres defaced by parked cars; air pollution, damages to the landscape caused by infrastructure... This essay focuses on the environmental problems caused by motor vehicles exhaust and on the political history of automotive emissions regulation since this topic represents an ideal starting point for examining the Italian case in relationship with international historiography which has been chiefly concerned with environmental problems caused by exhaust fumes.

In Italy – as in the other industrialized countries and, more recently, also in developing countries – the car has not only been a means of transport or a product of technology capable of revolutionising land transport, but it has also

been the agent of social transformation, a symbol of freedom, independence, wellbeing and progress all at the same time (Flower 1981; Flink 1988; Ladd 2008). The car contributed to create a new symbolism which became established within the collective perception according to which modernization was identified with racing cars of the Mille Miglia, economic Fiat cars, the viaducts and tunnels of the Autostrada del Sole, the bold architectures of the road system and the Motta and Pavesi Autogrill (motorway restaurants).

The car not only changed daily life. The progress of the *motorcar revolution* physical space also radically changed: the landscape was greatly altered by motorways and by newly built infrastructure. Furthermore, urban space itself appeared to have been newly planned to suite a new mobility: viaducts, road junctions, petrol service stations, squares and roads filled with parked cars, new suburban high rise tenement blocks defined a new architecture for the expanding city.

Environmental changes brought about by the car have presented us with entirely new problems. The other side of motorization was the incredible traffic jam caused by the inadequacy of the road system; old town centres defaced by parked cars; air pollution and damages to the landscape caused by infrastructure.

This essay focuses on the environmental problems caused by motor vehicles exhaust and on the political history of automotive emissions regulation since this topic represents an ideal starting point for examining the Italian case in relationship with international historiography which has been chiefly concerned with environmental problems caused by exhaust fumes (Doyle 2000; McCarthy 2007, 176-206; Ladd 2008, 69-96; McCarthy 2009).

## **An inconvenient discovery: the car may damage the environment**

The earliest studies linking photochemical smog with the residual products of combustion from motor vehicles were published in the United States in the early 50s: in 1950 Californian biochemist Arie Haagen-Smit showed that there is an undeniable relationship between the smog enveloping Los Angeles and the car exhaust: he was able to establish that photochemical smog was produced by the reaction of hydrocarbon compounds with nitrogen oxides under the influence of sunlight energy. The Air Pollution Control District of Los Angeles (Apcd) concluded that road traffic was responsible for 50% of the air pollution in the United States: Apcd estimated that a motor vehicle engine produced 3.37 kg of poisonous substances for every ten litres of gasoline consumed, and that for damages caused by smog, every United States citizen should pay an annual tribute of ten dollars[i].

In the 50s, even in Italy, the car started to be suspected of being – along with household heating and industrial plants – a major cause of air pollution.

In 1952, the problem was reported to the Chamber of Deputies by member of parliament Palenzona who presented a parliamentary question to the Minister of Industry and Trade and Industry and to the High Commissioner for Public Health. The response of the Minister (Pietro Campilli) was very reassuring: after all, only 781,992 motor vehicles circulated in Italy and the request by Palenzona must have appeared as little more than bizarre [ii].

The problem of air pollution caused by motor vehicles seemed an issue of secondary importance for at least three reasons. Firstly, Italy was therefore far from being a motorized country: car density [iii] continued to be very low. In 1952 there was a car every 92.9 inhabitants, against, for example, 55.9 in West Germany, 21.8 in France, 19.9 in Great Britain, 7.5 in Australia, and 3.5 in the United States. Secondly, technological determinism and technology enthusiasm which pervaded Italian society in the 50s induced to think that scientific and technological progress should have been able to solve eventual problems caused by pollution. Thirdly, environmental protection was considered a luxury which could only be afforded by those enjoying a high standard of life, which is why issues related to environmental policies were considered much less urgent than those designed to ensure better living standards and a minimum of social security to large sections of the population who still lived in conditions of poverty.

The question of atmospheric pollution also was ignored by the car manufacturers themselves that tended to minimize the concerns raised by scientists and to disseminate information contradicting those collected by independent researchers. In the first half of the 50s, the car trade was proving a very profitable business with a huge margin of market penetration and industry was not prepared to see their potential earnings lowered by an investment of money in equipping cars with emission-control devices that, among other things, were not of any stimulus to sales. A second reason why the car manufacturers were opposed to the dissemination of data on the harmful effects of exhaust fumes was the fear that disclosure of alarming news would inevitably cause a slowdown in car sales at a time when the conditions for an unprecedented expansion of car ownership were at hand.

In November 1957, a Conference on air pollution (*Congresso per l'inquinamento atmosferico*) was held in Milan, to which fifty delegates took part from twenty three European countries who had responded to calls from the World Health Organization [iv]. For the first time in Italy, cars were described as a "source of danger" and reports showed that in some areas of Milan the percentage of carbon monoxide in the air was similar to that of Los Angeles (equivalent to one part of oxide out of 4,200 parts of air). Following the conference in Milan, the National Research Council (Cnr) entrusted research on the "*malaria urbana*" (urban noxious air) to a scientific committee whose conclusions were to be used for the preparation of "a series of bills" [v].

In 1964, in the September-October issue of the *Annals of Public Health*, the Ministry for Health published a study by professor Cominelli which

unequivocally accused road traffic as a major source of pollution[vi].

Still in June 1964 (urged by the Council of Europe's Consultive Body since 1961) an European Conference on air pollution was held in Strasbourg, during which it was decided to create a Committee of Experts which only became operational in June 1966: its activities included the monitoring and analysis of pollutants, the collection of statistical data and the carrying out of research aimed at the study and the comparison of national legislations.

### **The first law on air pollution and the *malaria* of cities**

In this climate, on 29 September 1965 the *Senate Health Standing Committee* began hearing of the first bill aimed at controlling air pollution[vii]. As to motor vehicles, the bill restricted itself to some very general statements: the first stated that motor vehicles were not to "produce polluting effluents, however caused" and the second that diesel vehicles were not to "emit fumes of an opacity above the levels set by the regulation". The only concrete measure taken in the bill provided that the periodic overhauling of these vehicles should include the monitoring of pollutants. As to the installation of devices on motor vehicles to reduce the toxicity of exhaust fumes, the bill stipulated that the Ministry for Health was empowered to make it mandatory only after asking a long series of opinions. The act (No. 615, 13 July 1966) was received with much criticism by the Italian experts, since in its text any reference to planning and technical tools to seriously limit the emission of poisonous substances was absent.

Although Italian legislation was not regarded as in line with legislation concerning air pollution as existed in other countries with a high motor vehicle density, in reality the rules approved by Act No. 615 were not very different from those passed in other European countries: the main difference was that Act No. 615 did not prompt any real provision capable of lowering the levels of air pollution since the Italian Parliament did not approve the rules for the effective enforcement of the law (Leone 1970; Isle 1971; Fabbri 1972; Aci 1973; Ladd 2008, 139-173; Uekoetter 2009, 202-217).

The most advanced legislation came undoubtedly from California: in 1963 this American state recommended the adoption of the recirculation of exhaust fumes and in 1966 it approved the first rules limiting the car exhaust: the concentration of carbon oxide could not exceed 1.5 percent and that of hydrocarbons 275 ppm. Furthermore, the concentration of carbon dioxide and nitrogen monoxide was also monitored. Finally, in 1967, the Californian legislation was implemented by the Federal Government in the Air Quality Act.

In France, on 2 August 1961 a framework act was passed which for the first time considered the phenomenon of air pollution as a whole, establishing standards for motor vehicles and domestic heating. The French legislation (updated with the Decree of 12 November 1963) required the control of exhaust fumes for all motor vehicles and also indicated the measuring

instrument: a photoelectric cell opacimeter approved by the Ministry of Public Works and Transport. In addition, the measure stated precisely for each type of vehicle the level of opacity of the exhaust gases which was not to be exceeded in any way. A further provision of 28 July 1964 required the monitoring of gases emitted by engine sumps.

In England, the Road Traffic Act of 1964 stated the upgrading of manufacturing techniques so as to prevent the emission of visible smoke or gases. Moreover, it prohibited the use of devices capable of increasing the fuel flow to engine while in motion and decreed that the use of a motor vehicle emitting an excess of gases or fumes was a punishable infringement. The Road Traffic Act did not regulate in any way the emissions of invisible substances that were unanimously regarded by experts as the most dangerous and responsible for the increase in air pollution.

In 1964, Belgium and West Germany began to draw strict regulations which declared that all pollutants, solid and liquid, could alter the natural composition of the atmosphere.

Act No. 615 was passed at a time – i.e. the second half of the 60s – when Italy was slowly developing a growing interest in issues related to pollution so that the issue also received increasingly more space in motor magazines.

In February 1969, the problem of pollution caused by motor vehicles was discussed during the work of fact-finding inquiry on Italian motor industry promoted by the 12<sup>th</sup> Standing Commission of the Chamber of Deputies[viii]. During the hearing, Giovanni Agnelli and Dante Giacosa (the person in charge of industrial planning at Fiat), merely asserted that Fiat was taking “a lot of resources to solve two fundamental problems of air pollution and safety”. They also asserted that internal combustion engine would have undergone some improvements, but would still enjoy “a long life, perhaps very long, for technical and economic reasons”. The Chairman of Alfa Romeo (Giuseppe Luraghi) was skeptical about the effectiveness of anti-pollution measures and he aimed to belittle the legislation adopted in the United States. Luraghi, like Giacosa, remained convinced that the “domination” of the internal combustion engine would have lasted long, in spite of the fact that the major car manufacturers had been studying for some time two new engine types (one a “rotary engine” and the other one a “turbine engine”) and stressed that competition would inexorably limit the development of research.

The representative of the *Italian Automobile Union* (Sindacato italiano dell'automobile) denied manufacturers' claims and – denouncing the backwardness of Italian industry in the study and development of an alternative to the internal combustion engine – said that “the advent of a transformation of the car” could be further delayed only by the “big interests consolidated around the traditional techniques and economies linked to it”.

In March 1969, a conference on pollution caused by motor cars was held in Milan, promoted by the environmental organization *Italia Nostra* (Italia Nostra



1970). The meeting of Milan was characterized by an harsh debate. In presenting the published proceedings, Carlo Ripa di Meana[ix] highlighted how in Italy the issue of pollution from cars was a taboo subject because of the backwardness of sector studies and for “possible crises in employment and competitiveness of the car industry” following the eventual adoption of mandatory anti-emission devices.

Despite the resistance of the automobile industry, in Italy too there was a strong debate about pollution caused by motor vehicles. In the course of 1970 the clash between environmental problems experts and the car industry went on. The incompatibility of the two positions clearly emerged out of two important conferences: the first, promoted by Italian branch of British Petroleum, took place in Milan on 18 April 1970; the second, organized by National Hydrocarbon Corporation (Eni) took place in Rome on 18 and 19 June 1970. During the Milanese meeting it was emphasized the “opposition” to which the car was subjected. In short, car industry feared that the intervention of the legislator would end up with bearing excessively on production costs as well as discouraging the purchase of cars[x].

The conclusions of the Rome conference were diametrically opposite, since the majority of interventions were designed to demonstrate how pollution would cause harmful effects on health and on the quality of the air[xi]. During the Roman assembly it emerged also that the costs of “clean air” were not prohibitive. One study calculated that it was possible to equip all motor cars with catalytic converters at a cost per unit of about 37,000 Italian lire, and estimated for the period 1971-1981 an annual average investment of between 19 and 40 billion lire. The same car manufacturers postulated an intervention in three phases: the first triennium through the adoption of the “Clean Air Package” devices; in the second one with systems called “Man-Air-Ox” and in the final triennium through catalytic converters. This meant, for the period 1970-1985, an increase in spending for the purchase of motor vehicles of approximately 2,000 billion lire and an additional prime cost equal to 2,200-2,400 billion (Mammarella 1970; Carriero 1972).

However, both the assumptions put forward at the Rome conference, and that of the car manufacturers were not implemented; despite this, the motor magazines – apparently alarmed by a new increase in costs for motor car owners – took an ambivalent attitude: on the one hand they strongly denounced the existence of the problem, on the other, however, they expressed many doubts on the actual need to adopt legislative measures aimed at limiting pollution caused by motor vehicles. The monthly of the Commission for Industrial Motoring of Italian Automobile Club (Aci) published the report of the General Motors shareholders’ meeting in which it was alleged that the major causes for air pollution were attributable to industrial fumes[xii].

During 1970, the aci’s weekly magazine wavered between the publication of articles with encouraging contents and that of some polemical pieces with particularly alarming tones. Two editorials signed by Filippo Carpi de Resmini,

the President of the Automobile Club, had a great impact. He believed that the issue of pollution could be seriously tackled only through a change in the composition of petrol by removing lead additives in order to make possible the installation of catalytic converters on vehicles. The Aci President, however, proved not confident in the ability of the industry to implement agreements to quickly market unleaded petrol and motor cars fitted with catalytic converters. He also complained that Italian car engines were among the dirtiest in the world, so that some models did not follow the “standard of eligibility”<sup>[xiii]</sup>.

The problem raised by the President of the Italian Automobile Club finds its explanation in the peculiarities of the development of the car in Italy: one of these was the obsolescence of automobiles in circulation which remained (chiefly until the 1990s) a constant characteristic of Italian motorization. In Italy the motorization process has always been characterized by its “poverty”: whereas in European countries with a high car density (not to mention the United States) medium to medium-large capacity automobiles were predominant, in Italy the majority of car drivers owned low-powered cars (up to 1000 cc). Furthermore, once bought a car, the Italian car owners – whose mean income remained lower than that of other countries of the European Community – were not at all keen to replace their car with a new one since they did not possess the necessary financial resources. The opposition against the adoption of anti pollution measures, was chiefly due to fears of an economic nature: Italian car owners feared that the adoption of anti pollution technologies meant higher expenses in the use and upkeep, and first of all that this would mean to replace one’s own car more frequently (Paolini 2005, 111-142; Paolini 2007, 63-79).

## **From the second anti-smog act to the “battle” against unleaded fuel (1971-1989)**

Despite the vibrant tones of the internal debate and the spreading of alarm on the unstoppable decay of the urban environment produced by the exponential growth of traffic and air pollution, resistance against legislative measures aimed at lessening the environmental impact of cars continued to be considerable for at least two reasons. The first concerned the predominant role of the automobile industry in the Italian economy: up until the restructuring of firms which occurred during the first half of the 1980s, the car industry sector directly employed around 160,000 people (5.7% of the total of manufacturing industry workers), while by induction it insured jobs for two million workers. Public opinion was therefore staunchly against the introduction of any automotive emissions regulation since it feared that this may cause – in the event of a significant increase in the cost of motorvehicles caused by the installation of anti-pollution devices – a decrease in car sales which would generate a crisis for the entire Italian system of domestic production (Paolini

2005, 223-259). The second motive is strictly connected with the public opinion's perception of the car as a distinguishing shopping good. The commercial fortune of the car is to be attributed to the complex symbolic connotations which it carries. Since its first appearance the car has become the emblem of modernity and of the achievement of prosperity. In newspaper and magazine articles, for example, the car was presented as a "means for a better life" and it assumed the role of a healing device capable of solving all problems that confront daily life, and enabling its owner to become a more modern and even more highly educated person. The car was presented as the prime symbol of freedom and not only because it enabled its owner to reach any place without time-table restrictions, without wasting time and without the effort of carrying luggage by hand, but most of all because the very ownership of a vehicle made "one feel like a citizen and not like a subject" and conferred the awareness of owning a tool which enabled one to conquer time and space. The car was therefore at the same time cause, effect and symbol of social progress, of financial prosperity and freedom. Precisely at a time when – under the pressure of the up and coming environmental movement – in Europe and in the United States the earliest legislation aimed at reducing (through the control of emissions) the environmental impact of motor vehicles, the car was establishing itself as an emblematic object (object-sign, as Roland Barthes put it) even among the lower classes, as a sort of modern fetish through which one asserted himself before the others as one who had achieved prosperity and a new social status (Baudrillard 1974; Bourdieu 1979; Isherwood, Douglas 1979; Appadurai 1986; Codeluppi 1992; Capuzzo 2003; Scarpellini 2008).

In this context, the final push towards the approval of an automotive emissions regulation was given by the European Community with a directive (No. 70/220/EEC, 20 March 1970) which recommended the unification of the laws of member states concerning measures against air pollution caused by motor vehicles exhaust. The European directive had been conceived after long and laborious discussions for the abolition of technical standards for motor vehicles within the context of the World Forum for Harmonization of Vehicle Regulations (known as Working-Party 29 of the United Nations Economic Commission for Europe UN-ECE, instituted in Geneva in 1952) and of the Working party three (Ramírez Pérez 2010)[xiv].

To put into effect the directive No. 70/220, the Italian Parliament passed an act (No. 437, 3 June 1971) stated that among necessary features to obtain the type-approval of vehicles those relating to the limitation of pollutants should be included. The act also decreed that tests regarding the type-approval had to take place in the presence of an official of Ministry for Health and of Italian National Health Institute[xv]. The Act No. 437 only contained provisions designed to limit the emission of carbon monoxide while ignoring other pollutants such as lead oxides, tetraethyl lead and also nitric oxide in fuel used by diesel vehicles which were excluded from the bill.

Meanwhile, between 1966 and 1971, pollutant emissions from motor vehicles



had increased overall by 46.3 percent: the percentage increase was 6.7 percent for fine particulate matter, 6.5 percent for sulphur dioxide, 7.2 percent for nitrogen oxides, 7.6 percent for hydrocarbons, 8 percent for carbon monoxide and 8 percent for lead. As for sulphur dioxide, the most polluted region was Lombardy followed by Liguria, Veneto, Piedmont and Emilia Romagna (Tecneco 1973, 370-386).

The conclusions of the *First report on the environmental situation of the country* (Prima relazione sulla situazione ambientale del paese) – drawn by Tecneco in collaboration with the Ministry of Scientific and Technological Research and “under the auspices” of the Prime Minister’s Office – highlighted how the approved laws (No. 615/66 and No. 437/71) did not contemplate any possibility of real control, not even “on the occasion of periodic overhauling”. Effectively, there was “no clear obligation” to owners prescribing adequate maintenance and overhaul of vehicles and, moreover, no penalty was contemplated “for people driving vehicles and not complying with the requirements established by law”. Finally, both the 615 and the 437 laws completely ignored motor cycles and established no limit to the pollutants emitted by motor cars except carbon monoxide and hydrocarbons (Tecneco 1973, 370-386).

In this situation, the Automobile Club Stresa Conference took note of the environmental problems devoting the thirtieth edition (27-30 September 1973) to the subject “The automobile in society”. The reports presented during the proceedings were focused on analyzing the known data about pollution caused by motor vehicles: it was up to Carlo Pollone (deputy director of Fiat’s Technological research Unit) the task of summarizing the technological and legislative developments on the matter. Pollone admitted the delay of European car manufacturers in the study of anti-emission systems, but according to data presented by American car manufacturers, he stated that installing anti-pollution devices would have led to a substantial burden of costs for both producers and customers because of higher maintenance costs.

Furthermore, anti emission systems involved major problems for companies such the difficult handling of the high temperatures generated by catalytic converters, and the determination of the allowable tolerance on various components. In short, Fiat and other car manufacturers were not enthusiastic at the idea of having to equip their cars with new technologies which were already successfully tested in the United States: Chrysler for first had developed a modified engine that was called “Cleaner Air Package” which consisted in the calibration of the carburettor so as to provide particularly poor mixtures capable of cutting down carbon dioxide and hydrocarbons emissions. In the United States systems of fuel injection, additional devices to control emissions and appliances to limit the escape of petrol fumes from car tanks were also developed. In Italy, the only measure that was designed and applied was the gas recirculation valve (blow-by). Car industry, already for many years, had studied some alternatives to the internal combustion engines, especially the “turbocharged internal combustion engines, or Rankine

cycle, Stirling engines, electric propulsion, diesel engines with plungers” (Aci 1973).

Pollone – anxious to demonstrate how the “advantage” of pollution reduction was counterbalanced by the economic “disadvantage” – failed to say that in Italy the problem was more serious than in other countries since the Italian fleet of motor cars was mainly composed of economy cars, far more polluting than more powerful cars because the high compression ratio of the engine caused a very imperfect combustion: the result was a remarkable concentration of pollutants such as nitrogen oxides and unburned hydrocarbons. Pollone could not avoid to note the delay of European Community legislation in comparison to American and recognized that the adoption of the Clean Air Act and the establishment of the Environmental Protection Agency (Epa) had stimulated “an enormous expansion of research and development programs”. American laws stipulated the minimum standards of air quality, provided the adoption of any necessary measures to fulfil the approved standards and required that in 1975 emissions of carbon monoxide and hydrocarbons were to be lowered by 90 percent, while motor vehicles produced in 1976 would have to emit nitrogen oxides at a rate 90 percent lower than that allowed in 1971.

European legislation was far more permissive than the American: it required a reduction in emissions of carbon monoxide and hydrocarbons by 50 percent and 35 percent as compared to vehicles not fitted with anti-emission systems. Furthermore, it called for recirculation of exhaust fumes (blow-by) and laid down a safety limit for the carbon monoxide emitted by idling engines at 4.5 percent, which many experts judged too high and extremely harmful to health. Moreover, European legislation imposed a further reduction in carbon monoxide and hydrocarbons present in car exhaust, while it did not establish any limits for nitrogen oxides. Engineer Pollone, not without surprise and disappointment, declared that Sweden and Australia had decided “for reasons not clearly understood” to align with the standards of the United States. The reasons were not so unclear and lay in the inadequacy of European legislation and concerns about health hazards: in the United States some new very detailed studies had been published and these were showing, with an increasing wealth of data, the riskiness of car exhaust (Deweese 1974; Grad 1975).

Since the late 70s, the motor magazines – whose attitude was constantly torn between the demand for anti-pollution measures and protecting the interests of car manufacturers – reserved an ever larger amount of space to the growing problem of pollution caused by motor vehicles .

In early 1977, the magazine “Quattroruote” published two articles devoted to the “hydrogen engine” in which it remembered how the first patent, applied for by the American AF Burstall, dated back to 1927 and that in Italy, an engineer (Massimiliano Longo) was successfully testing an hydrogen engine on a Alfa Romeo 1300 Giulia. In December 1977, “Quattroruote” spread a report on the

“electric engine” to which worked Fiat, Ansaldo, Enel, Garelli, Magneti Marelli and Piaggio Zagato. The result was a series of prototypes such as Zele Zagato (range of 60 km), Fiat XI 23 (excellent performance and range of 70 km), the Fiat-Enel Van (range of 50/80 km, operating costs equal to 3,000 Italian lire per 100 km) and the Taxi PGE (range of 100 km at an average speed of 50 km per hour). In July 1979, at last, “Quattroruote” gave great prominence to the Fiat 131 model powered by a hybrid electric-petrol engine presented by Fiat at the Detroit Motor Show[xvi].

In 1983, the controversy about the harmful effects produced by leaded petrol emerged in Italy too. The issue was raised in 1981 by British consumer associations with the dual aim of denouncing the high toxicity of leaded petrol and obtaining the cancellation of a rule by the European Community which forbade member states to produce unleaded fuel. In April 1983 – after a study had found that the car was responsible for 70 percent of lead emitted into the atmosphere – the British government passed a law making it compulsory to use unleaded gasoline for all cars produced beginning from 1986. Furthermore, the law set to 1995 the date for withdrawal from the market of leaded petrol. The British government’s decision was shared by other European countries, except Italy and France. Germany also imposed the adoption of catalytic converters – needed to limit the emissions of five substances (nitrogen oxides, carbon monoxide, unburned hydrocarbons, sulfur dioxide, aldehydes) and working only with lead-free fuels – in all cars produced beginning from January 1986: the measure was motivated by the need to drastically reduce the substances responsible for acid rain (nitrogen oxides, unburnt hydrocarbons, sulphur dioxide) that were severely damaging the German forests. The Italian government had not followed the line of other member states in order to support the position of Italian car factories who requested the use of unleaded gasoline with a high octane rating (around 96), whereas in Europe the choice prevailed diminish the amount to 92.

The solution of the problem of car pollution still seemed very far away since the production of unleaded gasoline sparked a bitter controversy between those who wanted to encourage its use on cars not catalyst-fitted and those who sought to restrict the use of unleaded fuel only to cars fitted with catalytic converters. The crux of the matter was represented by benzene and other aromatic hydrocarbons – highly carcinogenic substances – found in unleaded petrol which served to maintain a high octane. Using these fuels to power cars not equipped with catalytic converters meant, therefore, filling the air with highly toxic and dangerous substances just like lead. Of this, car manufacturers were aware, along with refiners and even politicians[xvii]. In April 1989 the findings made by Commission of inquiry on fuels were released, which proposed reducing the maximum percentage of benzene from 5 percent in volume to 3 percent in weight and considered undesirable the use of unleaded petrol in cars not fitted with a catalytic converter since this would have resulted in an increase of pollutants (mainly aldehydes and aromatic hydrocarbons).

Consequently, Minister for the Environment Giorgio Ruffolo suggested to the government to put a ban on the sale of unleaded fuel for car not fitted with a catalytic converter, to adopt a measure to establish the maximum aromatic hydrocarbons, to reduce the price of unleaded petrol and to allocate sales incentives for the purchase of vehicles fitted with a catalytic converter. Some bills were also introduced aiming at limiting benzene to 3 percent in weight and aromatic hydrocarbons to 30 percent, in observance of the European directive to the effect that unleaded gasoline should not represent an additional source of pollution.

However, following a bitter campaign promoted by the *Italian Oil Union* (Unione petrolifera), on 12 July 1989 Minister Ruffolo signed a letter of intent for the reduction of aromatic hydrocarbons which set the maximum percentage of benzene at 4.5% in weight and that of other hydrocarbons at values set for unleaded petrol marketed in other European Community countries. It was an ineffectual measure – suffice to think that in Japan and the United States the maximum level of benzene was 1.5 percent – since the rules were too lax and unable to produce a real reduction in the amount of aromatic hydrocarbons in the air.

In October 1989, a response to such a weak decision by the government came from “Quattroruote” which proposed its own “anti poison therapy” focused on a clean engine without catalytic converter. The proposal of the monthly magazine was a compromise between the positions of environmentalists and those of Italian car manufacturers, who had always been very lukewarm towards anti-emission technologies.

Meanwhile, between inconclusive ideas and farcical measures, the pollution problem grew more serious.

## **From the 1990s to the early twenty-first century**

In 1990, in Italy, 430 million tons of carbon dioxide were emitted into the atmosphere (96 by transport), 1,938 of nitrogen oxides (1,141 by transport, including 945 by motor vehicles), 2,192 of non-methane volatile organic compounds (1,121 from transport, including 954 by vehicles), 1,653 of sulfur oxides (124 from transport of which 102 by vehicles). So, motor vehicles represented a significant source of pollution: in 1991 they produced 643.3 million tons of carbon dioxide compared to 82.3 by aircrafts, 20.7 by ships and 8.7 by trains<sup>[xviii]</sup>. Air quality was affected in almost all medium to large urban conurbations, Milan in particular then Rome, Naples, Turin, Bologna and Florence. In Milan and in 34 other municipalities of the Milan hinterland, values of carbon monoxide exceeded the 20 milligrams (the alarm threshold was fixed at 10 mg) and those of nitrogen dioxide permanently surpassed the 400 micrograms set by the World Health Organization as alarm threshold (Istat 1995; Istat 1998).

Despite the large body of opinion opposed to anti-pollution measures, in 1994 came the approval of a ministerial decree (No. 114, 15 April 1994) which

established an urban system for monitoring carbon monoxide, sulphur dioxide, nitrogen dioxide, ozone and fine particulate matter. Once exceeded the levels of attention and alarm, municipalities had to adopt the measures deemed necessary. The adoption of anti-pollution measures was mandatory in case the alarm lasted for at least three consecutive days.

Local authorities tried to break down pollution levels with some buffer solutions such as the adoption of traffic on alternate days (“targhe alterne”), the restriction of road traffic in some time-course and on Sundays (“Sundays on foot”, “domeniche a piedi”). With regard to structural measures to reduce traffic volumes, Communes proposed a series of imaginative proposals such as sales incentives for electric vehicles, shared taxis, entrance fee in the historic centers (eco-pass). These measures were received by angry protests on the part of professional and craft associations (especially those of truck drivers, taxi drivers and traders) and citizens forced not to use their cars.

To begin from the second half of the 1990s, we have seen a considerable increase of sales of medium-high to high-powered cars: in the northern regions this increase has been above 35%. This figure clearly indicates that consumers' choices are especially inclined towards vehicles capable of undertaking even daily long journeys and that provide more comfort and safety. From an environmental view point, however, the diffusion of large and powerful cars has caused the occupation of more space, parking difficulties, more road congestion, higher fuel consumption and more polluting emissions. These vehicles (sport utility vehicle included) are used in cities on short distances with only the driver on board: such behaviour, therefore, results in a higher contribution to pollution in urban areas and in a higher degree of road congestion. The diffusion of such vehicles has ended with undermining environmental improvements due to a progressive diffusion of cars responding to the more recent European recommendations (Euro 3 and Euro 4): it is clear that on the basis of equal power and fuel consumption a new generation vehicle has an inferior environmental impact to that of an older vehicle, however, this positive factor has been partly neutralized by the expansion of powerful cars and by those fuelled by diesel.

Notwithstanding the fact that Italy has applied European recommendations in matters of air pollution with Ministerial Decree No. 60 of 2 April 2002 – setting much more severe limitations to the main pollutants – almost all the chief cities of Italy continue to disregard the limits imposed by European directives in spite of these having been accepted by national legislation. For what concerns nitrogen dioxide, this goes well above the established limits in almost all the major Italian cities. For what concerns ozone (European legislation has established the limit at  $120 \mu\text{g}/\text{m}^3$  not to be exceeded for more than 25 days in a year) this limit is observed in only four cities. Fine particulate matter ( $\text{PM}_{10}$ ) remains the pollutant presenting the gravest problem. Notwithstanding the growing number of measures of a non structural nature aimed at reducing the concentration of fine particulate matter in the air (stops to traffic, alternate number plates etc.) the effectiveness of such



measures is unsatisfactory since no city is capable of remaining within the limits ( $50 \mu\text{g}/\text{m}^3$  not to be exceeded for more than 35 days in the year) imposed by legislation (Legambiente 2006; Apat 2006; Ispra 2009).

## Conclusion

In conclusion, despite the constant updates of legislation and the introduction of measures aimed at containing pollution within an acceptable threshold, environmental emergency caused by vehicular traffic is still far from being resolved.

If replacing leaded petrol with unleaded gasoline, improving diesel fuels and using catalytic converters has decreased the concentrations of lead in the air, carbon oxides, nitrogen dioxide, sulphur dioxide and other pollutants such as benzene and fine particulate matter remain well above danger levels. According to the *Report on air pollution in Italian cities: impact on health* compiled by the National Agency for Environment (Agenzia nazionale per l'ambiente) and by the World Health Organization, only  $\text{Pm}_{10}$  fine particulate matter is responsible, in eight major Italian cities, for 3,500 deaths, 1,900 hospitalizations for respiratory problems, 2,700 hospitalizations for cardiovascular diseases and 31,500 acute bronchitis fits (Who 2006).

To radically reduce pollution, there is only one way forward: the replacement of internal combustion engines with new engines powered by electric energy or hydrogen. In the immediate future, however, it is unlikely that these technologies will be adopted on current models: electric cars continue to have high costs and a limited range, while those that do not produce hydrogen gas on board (hydrogen is placed in a refrigerated tank at  $-253 \text{ }^\circ\text{C}$ ) pay for the problem related to the lack of a distribution network, still far from being developed. Hydrogen engines with reformer technology (a sort of chemical plant that draws fuel from methane or petrol) have unsustainable costs that prevent any kind of mass production (Mom 2004; Mikler 2009; Fuhs 2009; Mitchell, Borroni-Bird, Burns 2010).

The slow diffusion of hybrid models and alternative fuels – little used are also reformulated gasolines (containing low amounts of aromatic hydrocarbons, substituted with additives of plant origin) and white diesel (a mixture of water, oil and additives) – suggests that, at least in Italy, the “clean car” is destined to remain an utopia for many years to come.

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## **Biografia**

Federico Paolini è ricercatore di Storia contemporanea presso il Dipartimento di Lettere e Beni culturali della Seconda Università di Napoli. I suoi interessi di ricerca riguardano la storia dell'ambiente, la storia dei consumi e la storia sociale dei trasporti. È membro dell'European Society for Environmental History (Eseh) e dell'Association for the East Asian Environmental History (Aeaeh). È membro del Comitato di direzione di "Ricerche Storiche" e dell'Editorial Board di "World Environment". Tra i suoi titoli, *L'esperienza politica di Oliviero Zuccharini. Un repubblicano fra Mazzini, Mill e Sorel* (2003), *Un paese a quattro ruote. Automobili e società in Italia* (2005), *Storia sociale dell'automobile in Italia* (2007), *Breve storia dell'ambiente nel Novecento* (2009), *Firenze 1946-2005. Una storia urbana e ambientale* (2014).

## **Biography**

Federico Paolini is researcher in Contemporary History at Department of Arts of the Second University of Naples. His research interests focus on environmental history, mass consumption history and social history of transport. He is a member of European Society for Environmental History (Eseh) and Association for East Asian Environmental History (Aeaeh). He is member of "Ricerche Storiche" and "World Environment" Editorial Boards. He is the author of *L'esperienza politica di Oliviero Zuccharini. Un repubblicano fra Mazzini, Mill e Sorel* (2003), *Un paese a quattro ruote. Automobili e società in Italia* (2005), *Storia sociale dell'automobile in Italia* (2007), *Breve storia dell'ambiente nel Novecento* (2009), *Firenze 1946-2005. Una storia urbana e ambientale* (2014).

[i] As a matter of fact, as long ago as '20s in the United States some studies on pollution had appeared: See George A. Burrell, *Vitiation of garage air by automobile exhaust gases* (Washington DC, Bureau of Mines 1919); Arno C. Fieldner, *Automobile exhaust gases in vehicular tunnels* (Washington DC, Bureau of Mines 1920) Royd R. Sayers, *Effect of repeated daily exposure of several hours to small amounts of automobile exhaust gas* (Washington DC, Bureau of Mines 1929).

[ii] Atti parlamentari, I Legislatura, Camera dei Deputati, *Discussioni, Interrogazione dell'on. Palenzona e risposta del ministro dell'Industria e del commercio Campilli*, 12 December 1952.

[iii] Car density is the measure used in the statistics published by the Italian Association of the Automotive Industry (Anfia) to measure the level of motorization. The density of cars indicates the relationship between resident inhabitants per car: the higher is the number of resident inhabitants, the lower is the level of development of private motorization.

[iv] *La malaria delle città*, in "Pirelli", January-February 1958.

[v] Indeed, a bill was introduced by Communist Senator Scotti on 20 November 1958. The measure decreed that industrial cities or cities with heavy car traffic should provide weather stations specialized in the monitoring of pollution sources. It also authorized communes to take the necessary step to reduce car traffic whenever the level of air pollution had reached concentrations deemed dangerous. The Scotti bill remained with the *Senate Health Standing Committee* and it was never passed. To begin from 1960, pollution caused by motor vehicles began to feature in the motor press which provided space devoted primarily to the relationship between the inhalation of poisonous substances released by car exhaust and the onset of respiratory diseases. In its first issue of 1961, the journal of the Commission for industrial motoring (Commissione per l'automobilismo industriale) of the Italian Automobile Club (Aci) emphasized the role of motor vehicles as sources of air pollution and listed the harmful effects of smog. The following year, the aci weekly highlighted the fact that in Italy there was not a "law against gas", while the monthly of the Touring Club's Experimental Institute for the Roads Commission (Istituto sperimentale della Commissione strade) published an article with preoccupied tones indicating the morbidity related to air pollution.

[vi] *Annali della sanità pubblica*, XXV, September-October 1964.

[vii] On parliamentary debate about Act 615 see Atti parlamentari, IV Legislatura, Senato, *XI Commissione (Igiene e sanità)*, sessions 29 September 1965, 13 October 1965, 14 October 1965; Atti parlamentari, IV Legislatura, *XIV Commissione (Igiene e sanità)*, sessions 21 April 1966, 28 April 1966, 5 May 1966.

[viii] Camera dei Deputati. *Indagini conoscitive e documentazioni legislative, n. 7. Indagine conoscitiva della XII Commissione permanente, Situazione e prospettive dell'industria automobilistica nazionale*, Roma, 1971.



[ix] Carlo Ripa di Meana is an Italian politician and environmentalist. As a member of the Italian Socialist Party, he has been Commissioner for culture and environment in the two European Commissions chaired by Jacques D elors (1985-1992). From 1993 to 1996 he has been the national spokesman for the Italian Green Party. From 2005 to 2007 has been President of Italia Nostra.

[x] *Resoconto stenografico della Tavola rotonda sul regolamento per ridurre l'inquinamento atmosferico causato dai gas di scarico degli autoveicoli*, in "L'automobile speciale", n. 6, 1970.

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[xiv] WP-3, instituted within the General Management of Industrial Affairs of the European Economic Community.

[xv] Atti parlamentari, V Legislatura, Camera dei Deputati, XIV Commissione (*Igiene e sanit *), sessions 31 March 1971 and 28 April 1971.

[xvi] *L'automobile elettrica: come e quando?*, in "Quattroruote", December 1977.

[xvii] *Achtung benzene*, in "Quattroruote", September 1989.

[xviii] Cf. European Commission, *Everything on transport statistics. Data 1970-2002* (dvd-rom), Luxemburg: European Communities, 2004; Organisation for Economic Co-operation and Development, *Environmental Data. Compendium 2004*, Paris, Oecd Publishing, 2004.