A Ten-Year Retrospective

INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

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THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

Written by Erica Stephan

The author thanks the ICCT participants, staff, and colleagues who generously agreed to be interviewed for this retrospective on the organization's first ten years: Tom Cackette, Yasuhiro Daisho, Axel Friedrich, John German, Hal Harvey, Drew Kodjak, Alan Lloyd, Margo Oge, Charlotte Pera, Anumita Roychowdhury, and Michael Walsh.

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2001 – 2011 LOOKING BACK

The International Council on Clean Transportation was born in the contemplative setting of Bellagio, Italy, in **2001**.

When clean air regulators from around the world first met in Bellagio, Italy in **2001** to agree on a set of common principles and goals for vehicle and fuels policies, they were prompted in part by the realization that too often they were busy reinventing the wheel. Questions that had long been settled in one country were being rehashed in another, without the benefit of information gained from previous research.

Michael Walsh, one of those present, describes the asymmetry. "The oil and auto industries were global, but we weren't. If you worked for Ford in India, you could turn to someone at Ford Europe and they'd say 'Oh yes, we had that problem and here's how we solved it.' We had nothing like that."

There were pressing problems to solve. Particulate matter in exhaust from heavy trucks and diesel cars had been linked to asthma and other respiratory diseases as well as lung cancer, but Sweden was the only country in the world to require the low-sulfur fuel that allowed most of the contaminants to be filtered out. China and India, two countries where rates of personal vehicle ownership would skyrocket over the next ten years, had just recently phased out leaded gasoline and started introducing catalyst-based standards on cars. And despite growing concern over transportation's role in climate change, not a single country had yet placed legally binding restrictions on greenhouse gas emissions from vehicles.

Eighteen regulators and experts from Europe, China, Japan, and the U.S. came together in Bellagio for three intensive days of meetings. They emerged with not only that foundational set of common principles but also the basis of a global expert network, later formally embodied in the International Council on Clean Transportation. Since then the council has grown to some two dozen participants, with a staff of similar size operating out of Washington, San Francisco, Brussels, Beijing, and soon Delhi.

The world's vehicle and fuels landscape looks very different than ten years ago. Leaded gasoline has almost disappeared, aggressive new passenger vehicle standards for GHGs in the U.S. and Europe and China are being implemented, and the world's first heavy-duty truck standards are in place in Japan and the U.S. and being prepared for Europe. Ultra-low-sulfur fuel is the new norm in the U.S., Japan, and Europe, with Beijing set to follow in **2012**. While many policy makers, activists, and industry leaders played a part, ICCT participants were involved in all of these victories.

However, major challenges remain. The tenth anniversary of that initial meeting in Bellagio offers an opportunity to assess the ICCT's experience over the past decade and consider how lessons learned should shape its priorities in the next.

WE'VE BEEN DOWN THIS ROAD BEFORE: CLEANING UP FUELS

Sometimes, the most useful new research in a policy debate is research that's already been done somewhere else. Founding ICCT members' work on getting lead out of gasoline showed this clearly, and served as a model for future efforts.

The European Union's **1989** ban on lead in fuel came about after a fifteen-year campaign that had to contend not only with special interests but also with the special obstacles of the EU's structure; one country could not act unilaterally due to trade barrier laws, so reams of data were compiled and analyses conducted as the so-called Stockholm Group of 10 countries seeking to ban lead worked to convince the rest. In **1997**, when China was considering its own ban, these European studies were used to achieve consensus quickly on phasing out lead. China's policy was hammered out within a few months, and a mere three years from the initial policy launch the entire country's fuel supply was lead-free. Similarly, in Mexico experience and knowledge gained in both Europe and the U.S. helped allay concerns about the cost of phasing out lead from fuel.

These successes were possible because of the personal cooperation and involvement of regulators at every step, something that would become a guiding principle of ICCT. In the words of Axel Friedrich, a German transport regulator and ICCT founding member, "Administrators actively working in government are who in the end will change the world."

With this lesson at the fore, the ICCT prepared to address the next big challenge, sulfur. In **2003**, the founding participants reconvened in Napa, California, to produce detailed consensus statements on five transportation priorities, with sulfur at the top of the list.

Sulfur in fuel is a catalyst poison, preventing catalytic converters and catalyzed diesel

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particulate traps from functioning correctly. Used with low-sulfur fuel, these devices can nearly eliminate gaseous emissions from gasoline fueled vehicles and particulates from diesels, in turn preventing smog and respiratory illness. For this reason, the first principle of the *Napa Statements on Motor Vehicle Policy* said simply, "Sulfur is the lead of the new century."

Progress since **2001** has been faster in some parts of the world than others, but as a rule, once countries have adopted targets, they have been met well ahead of schedule in response to pent-up market demand. In Europe, a small amount of low-sulfur fuel was introduced in **2007** to allow trucks to comply with upcoming **2008** regulations. When truck operators saw the advantages of the new fuel, demand was so great that oil companies quickly increased their production, and the fuel standards were met by **2009**, two years before the mandated deadline.

In Japan, too, the fuels industry complied with low-sulfur standards in advance of a government mandate. National standards were developed with the help of ICCT participant Professor Yasuhiro Daisho of Waseda University and scheduled to take effect by **2007**, but the 10 ppm target was met by **2005**. In this case, it was the government of Tokyo that first asked ICCT participants for advice in solving the city's air pollution problem. The city's first response, a "Say No to Diesels" campaign, was replaced by a voluntary commitment by refiners and truck manufacturers to retrofit diesel vehicles and introduce very-low-sulfur fuel. The resulting wave of publicity helped Tokyo negotiate with surrounding provinces to follow suit. When the national standards were introduced, this media attention prompted fuel producers to take voluntary action to demonstrate they were patriotic and concerned about clean air.

Just as California has led the way for emissions standards in the U.S. and Tokyo drove standards for Japan, regional governments are of great importance in China. They can serve as demonstrations: Beijing's successful efforts to create blue skies for the **2008** Olympic Games through alternate-day driving days and caps on industrial production showed the country the potential of emissions control in spectacular fashion. Furthermore, the provinces vary widely in terms of culture, wealth, and the relative contributions of vehicles and coal to local air pollution, so some can act faster than others. ICCT and

DIESEL FUEL SULFUR LEVELS (PPM), SELECTED REGIONS

COUNTRY	2000	2005	2011
Brazil		2000	1800
China (metros)	5000	350	50
China (nationwide)	5000	2000	2000
EU	500	50	10
India (metros)	2500	350	50
India (nationwide)	2500	500	350
Japan	500	50	10
Mexico		500	300
South Korea	500	100	10
U.S.	500	500	15

Progress in reducing fuel sulfur levels has been significant but uneven since 2001. Low-sulfur fuel is a key to the implementation of advanced emissions controls.

Sulfur is the lead of the 21st Century. The biggest challenge going forward is that unlike lead, which is an additive, it occurs naturally in fuel.

the China Sustainable Energy Program (CSEP) have worked with Beijing, Shanghai, and the fast-growing Shenzhen industrial region to help them implement standards that are stricter than the national ones.

In the U.S., the Environmental Protection Agency has established sulfur standards for most fuel, although they are slightly less strict than Europe's. Its Tier 2 standards for gasoline were developed in conjunction with emissions standards for vehicles, so that—as in Europe—the cleaner new vehicles would have the fuels they need to run properly already in place by the time they come onto the market. The ICCT has worked with the U.S. EPA to provide technical assistance to Mexico and China on implementing a similarly integrated approach to reducing sulfur in gasoline.

The biggest challenge going forward is that unlike lead, which is an additive, sulfur occurs naturally in fuel and removing it is a cost to the refiner. In many developing countries, state ownership of refineries or political incentives to keep fuel prices low make taking sulfur out of fuel more difficult.

Lack of available low-sulfur fuels has held back progress on vehicle standards in several countries, including Mexico and Brazil. While tougher national emissions standards have been decided, manufacturers cannot meet them because the needed technology requires cleaner fuel. While some countries have addressed this issue by planning to leapfrog to the next standard when the right fuel is available, this will continue to be a challenge.

Events can generate opportunities for those prepared to seize them. The success of efforts to create blue skies for the **2008** Olympic Games in Beijing demonstrated to China—where the ICCT has been engaged for years—the spectacular potential results of emission controls.

MMT AND INDIA

Another ICCT area of focus is metallic fuel additives, particularly methylcyclopentadienyl manganese tricarbonyl (MMT), which both degrades engine parts over time and can potentially cause serious and irreversible brain damage. A potent neurotoxin, MMT can accumulate in the brain and cause Parkinson's-like symptoms including loss of motor control and memory loss. Automakers and health advocates agree on its elimination and it has been restricted in the EU and U.S. and banned in California. In many developing countries, however, it is still used and its presence is sometimes not disclosed.

In **2004**, Anumita Roychowdhury of the Centre for Science and Environment read an ICCT expert report on MMT, little-known in India at the time but recently introduced by a few small refiners. She fired off letters to the Ministry of Petroleum and Natural Gas, citing the report on MMT's effects on vehicles and human health, which used that information to broker a voluntary agreement among India's large refiners to refrain from using MMT.

"If you can create global channels for filtering good information and science it is really enabling," says Roychowdhury. "It can help us fight in our part of the world where we don't get to see this kind of information in the public domain."

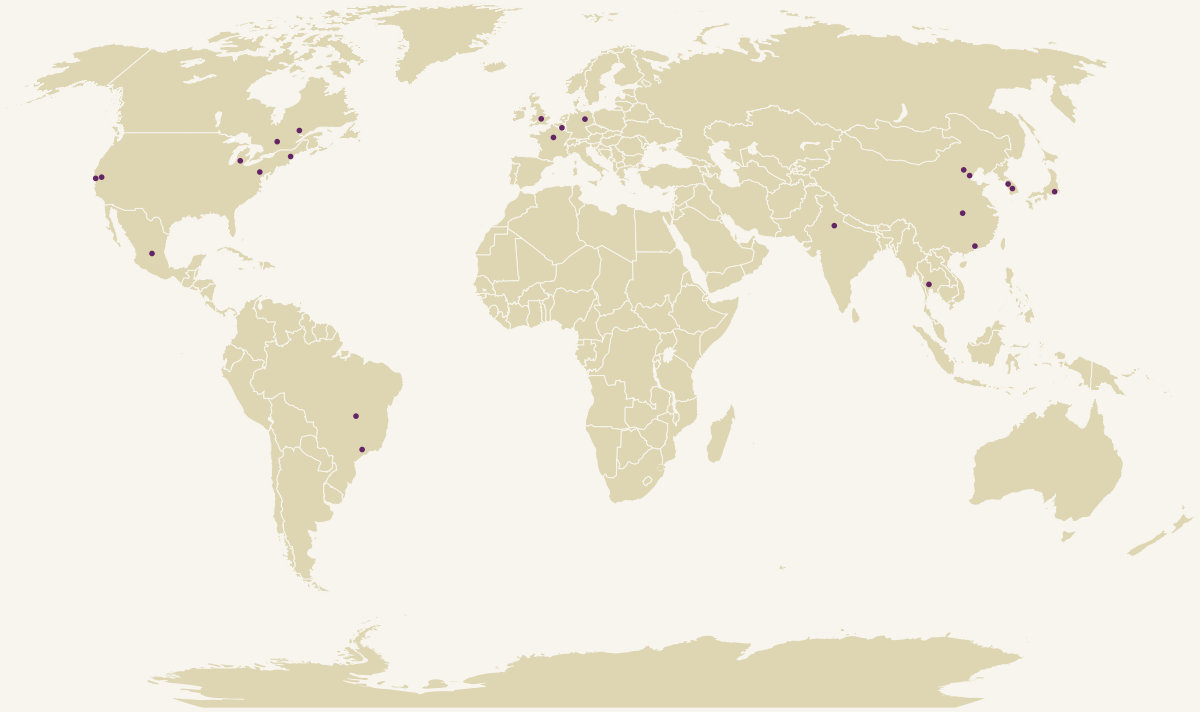
REGULATION IN A GLOBAL MARKET

"Three billion people around the world follow some version of the EU standard for conventional pollutants," says ICCT executive director Drew Kodjak, "and most of them are not in Europe. They're in China, India, Mexico, and Brazil."

EU emissions standards, while developed for European regulatory and manufacturing environments, are being adopted with a four- to ten-year time lag by developing countries, particularly in Asia and Latin America. California has had decades to settle into the role of test laboratory for U.S. policies. Now Europe, and the U.S. to a lesser extent, may be taking on a similar position in regard to the developing world.

On the one hand, this is good news since it allows manufacturers to build to a single, high standard and generates a virtuous feedback loop creating demand for cleaner fuels. In fact, the landscape is evolving so rapidly that in China, local vehicle manufacturers voluntarily chose to build to higher standards several years ahead of schedule in anticipation of stricter

ICCT participants have come from regions that account for the vast majority of new vehicle sales globally, and the world's largest and most dynamic trading economies.



regulations. On the other hand, standards designed to work with European levels of in-use testing and enforcement may not work as well in developing countries still trying to build that infrastructure. As vehicles age, emissions controls deteriorate, and without routine testing and enforcement the advantages of better standards are lost. The issue is further complicated when standards differ in the imported new and used vehicle markets.

Against this accelerated timeframe, the ICCT network can be of great value. Regulators in Europe and the U.S. can share the lessons learned with their counterparts in developing countries, and they in turn can provide input on the conditions where these standards will eventually be applied.

In China, ICCT's partnership with locally based CSEP and the presence of ICCT founding member Kebin He has helped it provide timely, tailored responses to policy questions. Dr. He and his students at Tsinghua University developed an on-road vehicle emissions model that demonstrated the effectiveness of good regulations in reducing oil imports, ozone, and particulate pollution; this evidence helped usher in the adoption of stricter national standards. Some of Dr. He's students, including Dr. Dongguan He and Dr. Hong Ho, are continuing to work with ICCT in China and CSEP to shape future regulations.

In India, ICCT helped develop the country's first fleet model, providing a necessary basis for the country's first regulations. However, researchers cannot sit back and relax; the vehicle emissions standards plan only went up to **2010**, and the country is just now developing a new roadmap. ICCT is working with Indian partners to ensure the studies feeding into this roadmap are of high quality, and will hold a workshop in Delhi in late summer for regulators and advocates.

Internal combustion engines alone will not be able to meet the ambitious emissions targets set for 2050. But it is important to capture as many near-term savings as possible from ICE vehicles over the next decade.

TECHNOLOGY

No matter how well designed, internal combustion engine (ICE) vehicles alone will not be able to meet the ambitious emissions targets set for **2050** in many countries or deliver the long-term reductions needed to constrain climate change. Some next-generation technology—hybrid and pure electric drives, fuel cells, and biofuels—will be required. At the same time, because of the cumulative nature of climate pollution, it is important to capture as many near-term savings as possible from ICE vehicles over the next decade.

The greatest barriers to cleaner diesel engines are pollution technology cost—thousands of dollars per heavy-duty engine—and lack of availability of ultra-low-sulfur fuel, although misaligned standards also play a role. For example, the EU's CO_2 emissions standards for diesel vehicles are less stringent than those for their gasoline counterparts, distorting the market in favor of more-polluting vehicles. EU standards also create vehicle classes based on weight, not size, which discourages the use of advanced lightweight materials.

In gasoline engines, on the other hand, major emissions improvements are possible at very low cost, on the order of hundreds of dollars per vehicle. But these improvements require clean fuels and a level of engineering sophistication that is sometimes absent in developing countries. The issue is less one of "available technology" than "available engineering." Here, working with regulators to push toward stringent standards and in-use enforcement will drive industry to improve. A recent joint ICCT/ClimateWorks publication, *The Regulatory Engine,* details how strict GHG emissions standards in the U.S. spurred automakers to improve aerodynamics, tweak engine efficiency, and apply regenerative braking to conventional, non-hybrid cars—all improvements that ultimately led to a market advantage and new job creation.

While electric vehicle enthusiasts have found themselves disappointed before, ICCT president Alan Lloyd sees new opportunity today. There has been technical progress across the board on batteries and fuel cells, as well as a growing realization among regulators that meeting long-term emissions targets will necessarily require new technologies. Because electric vehicles do not rely on emissions control devices that deteriorate over time, they pose far fewer in-use enforcement challenges to developing country governments that may have insufficient staff. Furthermore, while Chinese manufacturers are not well positioned to compete making internal combustion vehicles, they see potential to capture the market on electric drive. Since China now sells more vehicles in a year than the U.S., such a move by local industry could significantly change the makeup of the world's fleet.

Progress across the board in batteries and fuel cells, and the realization that meeting long-term emissions targets will require new technologies, has created opportunities for electric cars and other advanced vehicles.

But this transition will not happen by itself. It will require both policies to encourage making

The ICCT's 2011 meeting, in Quintana Roo, Mexico, featured working sessions on a global policy roadmap for transportation and climate change.

and buying the vehicles, such as California's zero emissions mandate, and early investment to ensure that the necessary supporting infrastructure is available for drivers and avoid the "chicken and egg" problem. Regulators must also ensure that vehicles designated "zero emission" derive their electricity from truly zero-emissions sources rather than coal or gas.

CLIMATE

In **2009**, ICCT participants gathered in Athens for a meeting focused on transportation and climate change. Among the conclusions captured in the Athens Resolution were the need for government policy to unlock innovation and change, the importance of non-CO_2 climate forcers such as black carbon, and—in keeping with ICCT's emphasis on systems thinking—the need for a comprehensive approach to climate pollution.

Over the past five years, the ICCT has provided input to the U.S. in the design of both GHG and fuel efficiency standards for heavy-duty vehicles. The standards, finalized in August 2011, will reduce emissions by 250 million tons over the life of the vehicles and once again position the U.S. as a leader in transport emissions regulation. In California, ICCT has provided input and guidance to the Air Resources Board on the state's zero-emissions vehicle mandate since its inception. The mandate has evolved repeatedly over the past 20 years and grown to encompass multiple categories, aided by ICCT research.

"[In the U.S.], ICCT has been focused on greenhouse gas emissions from heavy-duty vehicles when other people weren't," said CARB's Tom Cackette. "They brought a bright light onto that issue and allowed EPA to work on it together with passenger vehicle standards." This same work can later be shared with China and Europe, which are currently finalizing standards for heavy-duty vehicles.

ICCT was and is closely involved with the EU's greenhouse gas and conventional pollutant regulations, including advocating against the voluntary agreements that proved to be ineffective and in favor of mandatory standards. ICCT prepared a document laying out important issues in advance of the Euro VI heavy truck standards, including the need to use Portable Emissions Measurement devices to ensure in-use compliance; the European Commission eventually adopted these recommendations. Several participants have worked with the European Commission to share best

U.S./CALIFORNIA

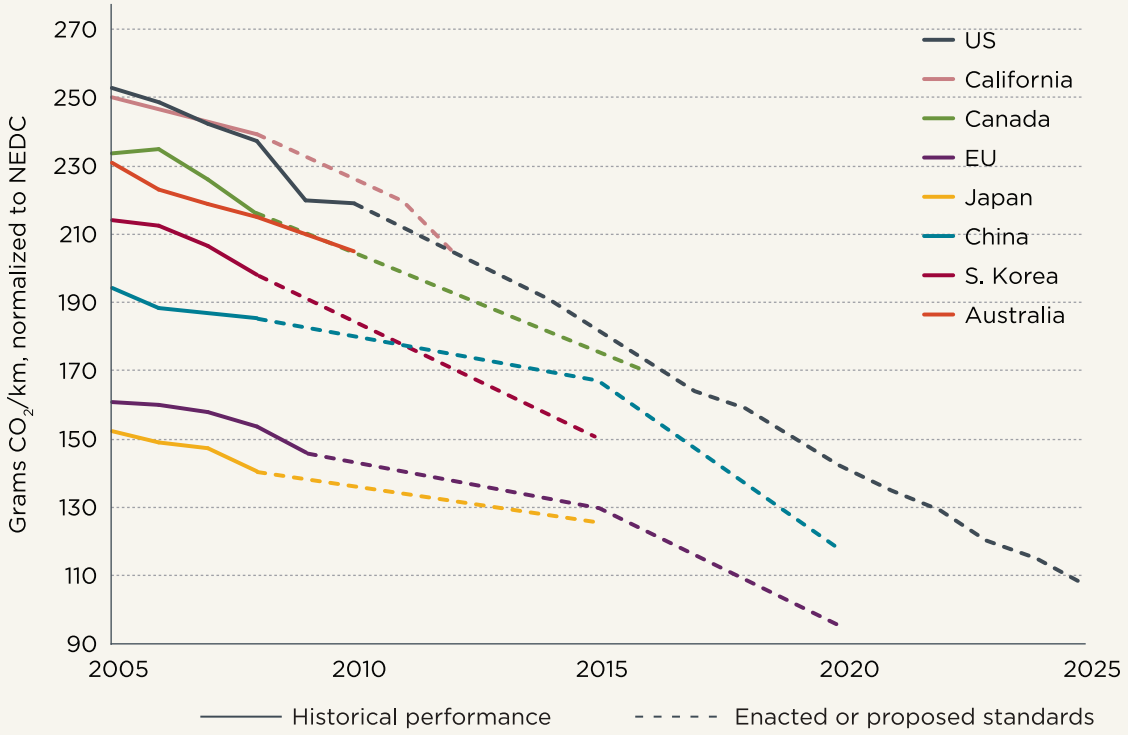
In **2004**, the state of California was poised to make history by implementing the first greenhouse gas emissions regulations for vehicles in the United States. Just prior to the announcement of these standards, which would require passage of an enabling law, the ICCT had helped develop a study comparing GHG standards in seven countries.[1] The mileage and emissions regulations had been in place for years, but standards and metrics varied, so "the general view was that the U.S. standards were the most stringent in the world," said Tom Cackette of the California Air Resources Board. "The ICCT study put what we did in context."

The report's centerpiece was a graph showing unequivocally that the U.S. was significantly behind most developed countries in terms of fuel economy and GHG emissions. Behind the visual lay hundreds of hours of meticulous technical work to translate different standards and draw meaningful comparisons.

While NGOs used the study for advocacy purposes, it was trusted precisely because advocates did not write it. In **2004**, California's regulations were approved and went on to form the basis for national standards in **2009**—returning the U.S. to a leadership position in vehicle emissions.

1 "Comparison of Passenger Vehicle Fuel Economy and Greenhouse Gas Emission Standards Around the World," (An and Sauer 2004).

VEHICLE CO_2 EMISSIONS AND TARGETS



The ability to make accurate comparisons across jurisdictions is crucial to exchanging information internationally, and is a key focus of the ICCT's analytical work—as demonstrated most famously by its frequently cited comparison of global passenger vehicle standards on a normalized driving cycle.

practices and data, and regulators from the Commission participate in ICCT meetings.

In the ten years since the Bellagio meeting, climate change has come to dominate the emissions conversation. Because of Europe's de facto role as a standard setter for developing countries, several ICCT participants caution that Europe must not lose sight of conventional pollutant regulation in its current focus on controlling CO_2. In the words of Michael Walsh, "If we don't get it right in Europe, it can have a very negative effect in China and India and other rapidly industrializing countries that are becoming more and more important."

THE ROAD AHEAD

The next ten years will see developing countries playing an even larger role and emerging as game-changing actors with their own policy success stories to tell. At Bellagio, Chinese participants were inspired more by the examples of India and Thailand than the U.S., and best practices from developing countries will only become more important in the coming decade. In **2001**, the Korean auto industry was barely emerging and copied others' designs: it is now a major player and innovator in the global market. The Brazilian ethanol industry is the world's largest and has shaped that country's fuel policies. Vehicle manufacturers now sell worldwide and benefit from global pollutant standards that allow them to use a single technology. Nonetheless, says ICCT executive director Drew Kodjak, technology-forcing regulations will continue to be generated in the U.S.

The idea of a harmonized, global set of integrated vehicle and fuel policies is more widely accepted today, thanks in part to ICCT's work. Yet while the goals may be identical around the globe, the process is not. As ICCT president Alan Lloyd says, "We must be humble in recognizing that ICCT's first word is 'international.' We

BLACK CARBON

Black carbon is a relatively new area of work for ICCT, and one that illustrates the organization's focus on getting the science right. To date, regulation of greenhouse gases from vehicles has tended to focus on CO_2 or fuel efficiency standards, without taking into account black carbon's effect on climate. Even California, which was the first U.S. entity to set greenhouse emissions standards for vehicles and which incorporates other greenhouse gases into its formula, does not include black carbon. Until recently, scientific opinion was still somewhat divided on whether black carbon from transportation had a net warming or cooling effect.

In **2009**, ICCT hosted a global workshop in London that brought policy makers together with scientists doing basic research on black carbon's effects in the atmosphere, so that they could share and discuss their findings. Later that year, several of the attending researchers published a joint article in *Nature* clearly stating that black carbon from on-road vehicles has a net detrimental effect on the climate, and needs to be addressed urgently through standards. This workshop was conducted in cooperation with Dr. Martin Williams, who at that time was working with the UK's Department of Environment, Forestry, and Rural Affairs.

Another ICCT workshop in Mexico City later that year centered on the dual benefits of health and climate from reducing this pollutant. ICCT founding participant Kebin He stresses the importance of black carbon in the developing world and particularly China, where climate change may be a medium-term threat but air pollution is an immediate public health crisis: "In talking about low-carbon, don't forget black carbon." However, no country has yet adopted BC-specific standards, both because many policy makers see general particulate standards as sufficient, and because it is difficult to be the first actor. An upcoming IPCC report on black carbon may help diminish the uncertainty surrounding this issue.

EUROPE AND GHGS

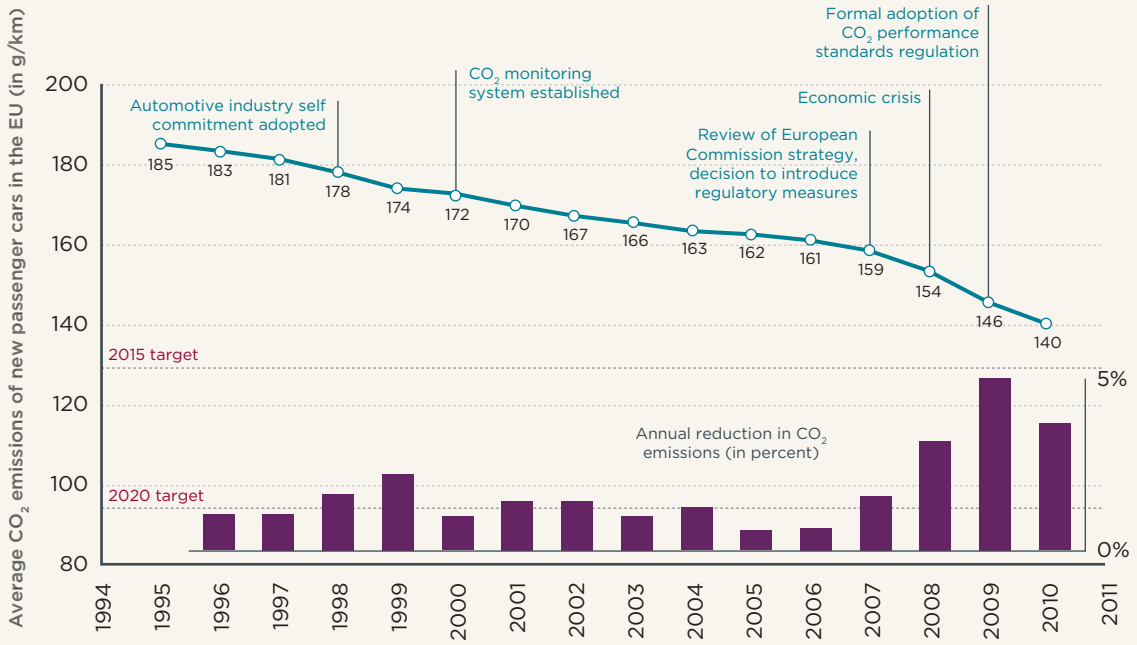
In 2009, the European Commission adopted legislation establishing a fleet-average emissions target for passenger cars of 130 g CO_2/km by 2015 and 95 g CO_2/km by 2020. A parallel regulation for light commercial vehicles was adopted in early 2011, setting targets of 175 g CO_2/km by 2017 and 147 g CO_2/km by 2020.

Since a quarter of Europe's GHG emissions come from the transport sector, reaching this target would have a powerful impact—and create a ripple effect, as many countries pattern their regulations on the European standards.

The 2020 targets are up for review in 2013. The ICCT will continue to feed data and detailed technological analyses into the public debate to foster a well-informed and fact-oriented discussion. The goal is not only to preserve the 2020 targets but to introduce new long-term targets defining a path to decarbonization.

CO_2 PERFORMANCE STANDARDS IN THE EUROPEAN UNION

New passenger cars 1995-2010



Recent trends in specific CO_2 emissions from new passenger cars registered in Europe highlight the significant difference that mandatory emissions performance standards can make. Beginning with the European Commission's announcement of mandatory CO_2 standards, the rate of reduction in specific CO_2 emissions from new passenger cars began to rise sharply: 1.6% in 2007, 3.2% in 2008 and 5.4% in 2009. While the effects of the economic crisis and resulting incentives for new vehicle purchases offered by many EU member states potentially distort the annual emission reduction for 2009, the trend is very clear: switching from a nonbinding voluntary industry commitment to a binding regulation spurred significant reductions in specific CO_2 emissions from new passenger cars in the EU.

The technical quality and credibility of ICCT research and the **political and geographical diversity** of its global network are widely acknowledged as the organization's greatest strengths.

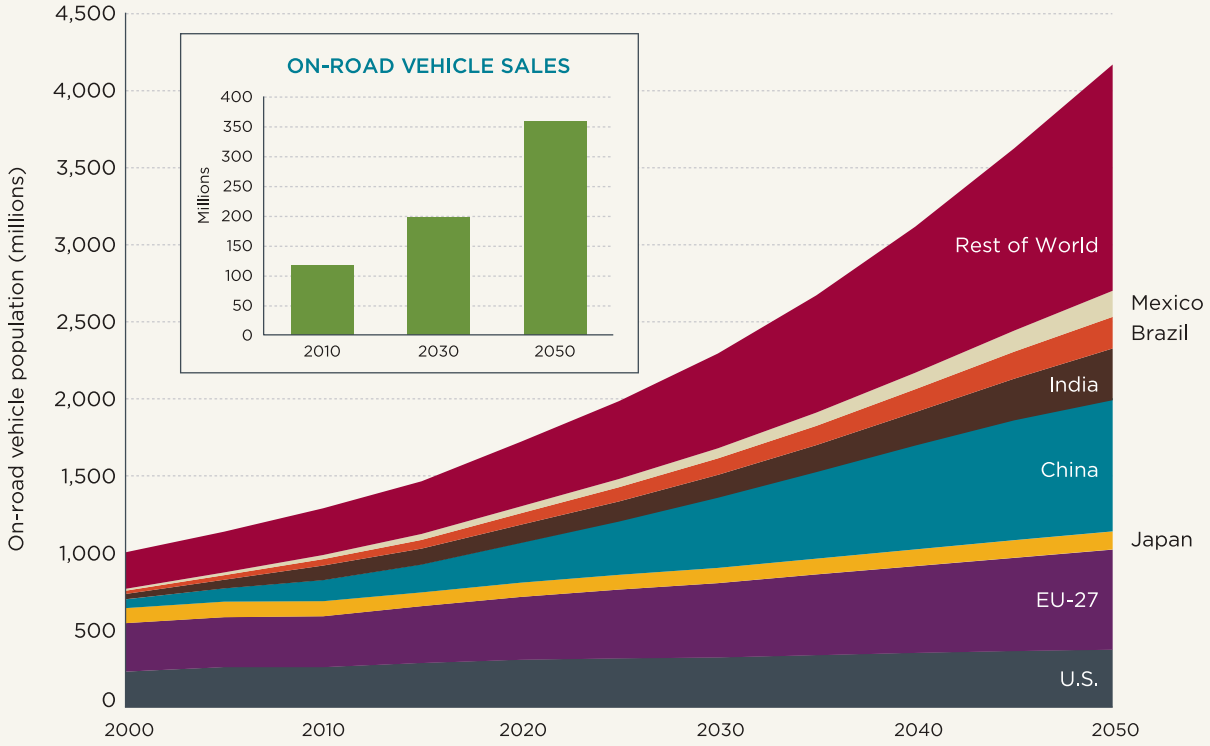
need to tailor our work to the needs of each country. What we learn will be country-specific."

In Michael Walsh's words, "the key is to find the right champion and couple it with quality technical work." In some cases, as with CSEP, the champion will emerge first. In other cases the work will be waiting for a champion.

The technical quality and credibility of ICCT research and the political and geographical diversity of its global network are widely acknowledged as the organization's greatest strengths. Continuing to hire good technical staff and maintain the highest standards are obvious mandates. And the group is working to find better ways to serve as an information hub, such as a technology database slated to come online next year.

Founding participant Hal Harvey considers ICCT a model for other best practice networks of experts, in part because of its quick response to information requests ("if you can answer regulators' questions within three days they will turn to you") and steady focus on the big picture. Over the next decade, he suggests, ICCT should keep to its core strengths and work to create the regulatory lock-in that will drive innovation for decades to come.

ON-ROAD VEHICLE POPULATION AND SALES



Preliminary projections by ICCT staff of worldwide sales and total global population of all on-road vehicles in a business-as-usual scenario based on historic trends illustrate the magnitude of the challenge facing transportation and environmental policy makers over the coming decades.

The International Council on Clean Transportation is an independent nonprofit organization founded to provide high-quality, objective research and technical and scientific analysis to environmental regulators. Our mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation sectors and fuels, in order to benefit public health and mitigate climate change.

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