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Community Exposure to Diesel Air Pollution in California's Transportation Corridor

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About Us

The **TriCounty Watchdogs** (TCW) works in the California mountain communities (total pop. approximately 10,000) that lead away from Interstate-5 twenty miles upward into the transverse range that defines the southern end of the San Joaquin Valley. We are at the nexus of Kern, Ventura, and Los Angeles Counties. Most of our work is in Kern County, which falls under the jurisdiction of the San Joaquin Valley Air District. Located at the intersection of four major ecosystems, we inhabit a unique biosphere that contains several endangered species, including the California condor. We are concerned about water scarcity, air pollution, protecting our cultural and historical heritage, improving economic opportunities, approaching sprawl, and the seeming indifference to the needs of our rural area by all three counties and the state.

Global Community Monitor (GCM), founded in 2001, trains and supports communities in the use of environmental monitoring tools to understand the impacts of industrial pollution on their health and the environment. GCM's work focuses on disempowered "fenceline" communities often low income and people of color harmed by serious air pollution. These communities struggle with environmental health issues related to pollution from mobile sources and industrial facilities. These community concerns are often ignored by the agencies and the corporations responsible for causing the problem. Over the past dozen years, GCM has developed and pioneered the use of "bucket brigades" (a grassroots air monitoring program) as a method for communities to document and understand the impacts of industrial pollution to launch advocacy efforts against polluters and to win stunning victories.

GCM's primary activity consists of providing training and on-going technical assistance to community organizations fighting pollution as well as strengthening an international movement of people negatively impacted by industrial pollution and climate change. We have worked with more than 100 community partners and partners in 27 countries.

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Executive Summary

The **TriCounty Watchdogs'** (TCW) work focuses on the mountain communities, a string of villages that lead away from Interstate-5 (I-5), twenty miles upward into the transverse range that defines the southern end of the San Joaquin Valley. This area overlaps Kern, Ventura, and Los Angeles Counties.

These communities are in the vicinity of the I-5 Highway, a major California roadway, which connects the Central Valley of California with southern California. Approximately 70,000 vehicles, of which an estimated 18,000 are large trucks with diesel-fuel engines, travel through a narrow mountain pass, through the community of Lebec, California.

Over the years, residents attending public meetings have voiced concerns about the visible dirty air that drifts up a narrow canyon connecting the San Joaquin valley floor to the Frazier mountain communities. Due to the topography of the area, air pollution from nearby cities and the Central Valley, collects in the narrow canyon. Air quality is further compromised by the heavy truck traffic that passes on I-5 through the community. Residents are also concerned about the incomplete data on ozone, suggesting that their children's asthma and severe allergies may be attributed to air pollution.

Sitting right next to I-5 is El Tejon Middle School with children's soccer and ball fields facing the freeway, with little to no barriers. Parents of students at the middle school worry about their children playing so closely to the emissions of the thousands of vehicles which pass by the school each day. Concerned community members point to the continuous river of truck traffic on the freeway, worried about diesel soot particulates.

Due to these community concerns and incomplete data by the San Joaquin Valley Air District, TCW pursued their own community air monitoring project. TCW was trained by **Global Community Monitor** (GCM) and conducted their own particle air monitoring from March 2011-March 2012. Members of the Watchdogs collected 51 air samples during this time period near community-identified 'hot spots', suspected areas of concentrated air pollution. These "hot spots" included locations near the middle school, the Lebec post office, the truck stop and two residences.

An analysis of the project's air sampling data indicates that the Lebec community, including a school with 240 students, is impacted by diesel particulate pollution from the heavy truck traffic along the Interstate highway. The levels found in the samples represent a risk of cardiovascular and respiratory effects, including increased incidence of hospitalizations and premature death.

GCM and TCW used citizen air monitoring to gather data that could not be obtained through the agencies. Data has shown that those who live, attend school and work in the Lebec area are greatly impacted by elevated levels of pollution caused by increased truck traffic along I-5. This air pollution impacts schools and community centers that provide services to sensitive

populations like children and the elderly, which are at higher risk of negative health effects due to compromised air quality.

Based on the results from the community air monitoring project, the TriCounty Watchdogs and Global Community Monitor make these recommendations to be implemented to reduce the negative health risks associated with the air pollution data documented in this report:

1. **Trees should be planted near the freeway to reduce emission exposures**

Studies have shown that planting trees between a major roadway and sensitive sites like school grounds can potentially reduce vehicle emissions by up to 30%.

There are also fields next to the middle school that the community uses for children's soccer and ball games. Because of the serious health risk from the diesel emissions coming from the Interstate, and the nature of the athletic activities where the children run and take in more air as they breathe than they would in less active activities, *we highly recommend that the ball fields be moved to an area much farther from the freeway*. Perhaps in the fields next to the county park in Frazier Park.

2. **Scheduling play periods at the Middle School to avoid times of high readings**

We recommend that the school monitor the live data from the air monitor in Lebec, (which is maintained on the San Joaquin Valley air district's website) and keep children indoors when the monitor in Lebec is witnessing spikes in PM 2.5. This is especially important in the afternoon during winter months, where recess and play periods should be scheduled to keep children indoors when levels are at their highest.

3. **Replant trees near businesses close to the Freeway**

At the location in Lebec near the Lebec Post Office, we recommend that trees that were recently removed behind the post office and antique store be replanted to reduce the emissions exposure of the residents who live near this area.

4. **Electrify the Flying J Truck Stop**

Electrifying the truck stop will allow drivers to plug in instead of idling their engines overnight, thus reducing a source of emissions.

5. **Ultra-fine particle analysis should be performed by the San Joaquin Air District.**

Further ultra-fine particulate analysis is needed because standard PM 2.5 monitoring does not properly identify ultra-fine particles.

6. **Reduce pollution from existing truck transportation:**

- Monitor pollution from highways.

- Set stronger air quality standards for locations near highways.
- Initiate, continue, and strengthen clean truck programs.
- Schools, health facilities and residences near truck routes should be allocated resources to address health impacts.
- Zone and plan to keep trucks away from populated areas.

7. Increase local government capacity to regulate and plan in tough economic times

New partnerships with the nonprofit and philanthropic sector, when deeply rooted in the public, can provide local authorities more tools and resources to address the negative health and environmental impacts of freight transportation.

We look forward to furthering the conversation between residents and governmental agencies in efforts to reduce exposure to the air pollution associated with the truck traffic on I-5.

Community Experience

I-5 towards the Grapevine Pass

The Los Padres National Forest surrounding the Tri-County area, which includes Kern, Ventura and Los Angeles Counties, is known for its beauty, with soaring stands of pine and oak forest. The area is a gently rising upsweep of rolling hills and a long central valley with horses and cows grazing. People move here for this scenic beauty and the opportunity to hike, camp, and picnic, enjoying the natural mountain environment.

A high number of low income residents live in the Lebec and Frazier Park area[1], with tiny pockets of near wealth at the highest elevations away from the freeway. An upscale house surrounded by many substandard dwellings stands out in the Lebec and Frazier Park area. Regional governments approve housing development projects thinking they are "providing jobs" in what they seem to consider "empty land". The Frazier Mountain communities do not have a lot of racial diversity in the area, and the needs of the small percentage of Latino and Native American segments of the population (approximately 20%)[2] are mostly ignored. A recent report showed that unemployment for the mountain communities was pegged at 17.5%, which is an indicator of how the economic downturn has affected our area.[3]

Anecdotally residents attending public meetings worry aloud about the visible dirty air that drifts up a narrow canyon connecting the San Joaquin Valley floor to what is thought of as a pristine mountain paradise. Residents have expressed concern over incomplete data on ozone and have suggested that their children's asthma and severe allergies may be caused by air pollution.

I-5 traffic in front of the school

According to Linda Mackay, "Many times during the year when the San Joaquin Valley is suffering from a lot of air pollution, I'll be driving down the grapevine towards the valley and I'll see the pollution moving up through the mountain corridor. The pollution has been so bad, there has been times when I thought I was seeing smoke from a fire, but then I realized it was actually smog. Often time you can see the pollution move up the grapevine and it visibly stops right around the middle school location. So

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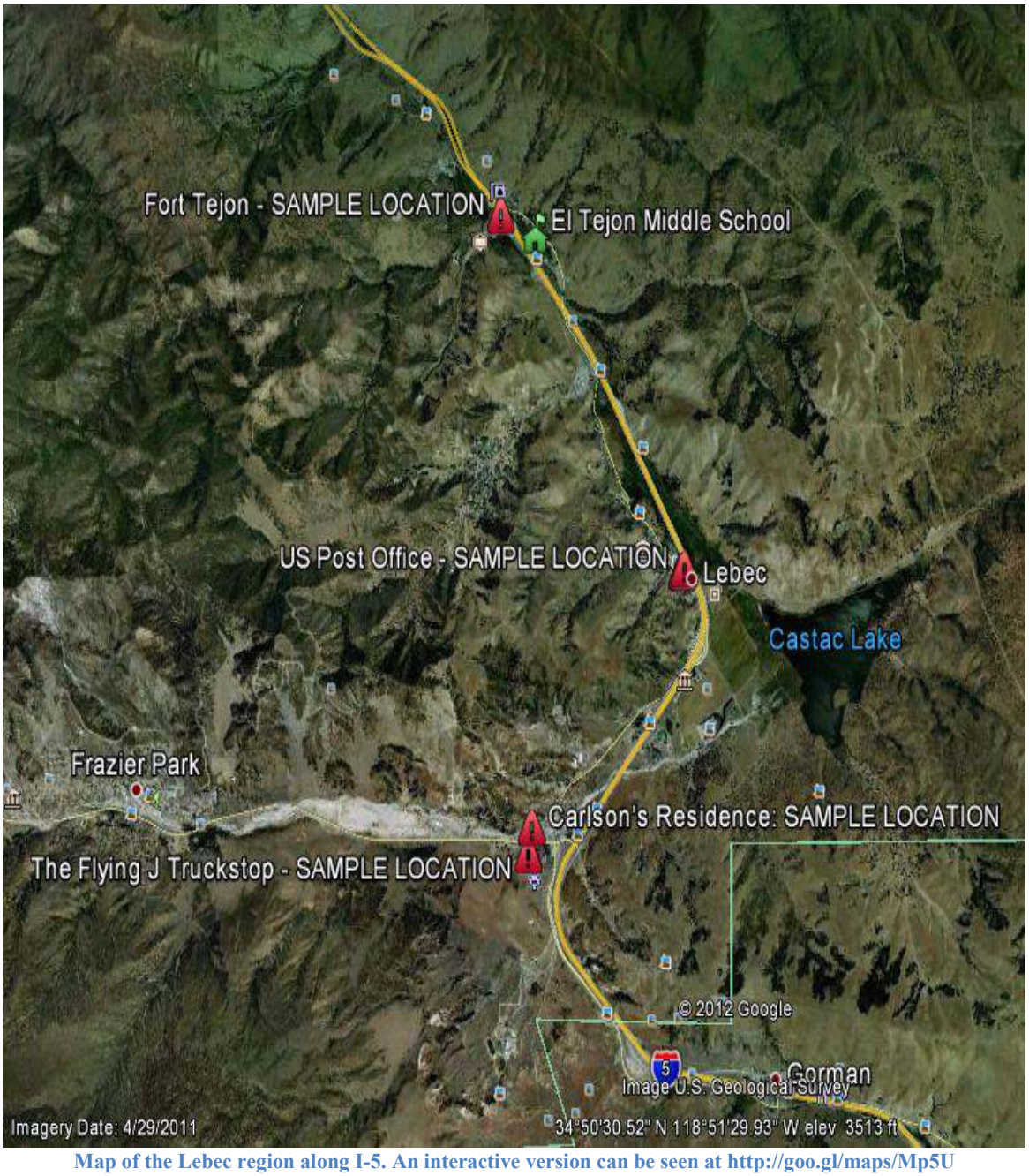
[1] Frazier Park, Community Income Survey,2003

[2] El Tejon Elementary School, School Accountability Report Card 2010-2011, https://docs.google.com/viewer?a=v&pid=sites&srcid=ZWwtdGVqb24uazEyLmNhLnVzfGRvfGd4OmFkYjIyYWU1OWM3NzA3NQ&pli=1

[3] Economy in Frazier Park, California, Sperling's Best Places, 2010. http://www.bestplaces.net/economy/city/california/frazier_park

not only is the middle school impacted by the vehicle emissions from all the traffic along I-5, but the children and staff at the school are also impacted by the air pollution moving up from the valley."

Parents of students at the middle school, located next to the freeway, worry about their children playing outside so closely to the emissions of the thousands of vehicles which pass by the school each day. In addition, the parents are also concerned because this school site is the location where all the district school buses idle each morning as they get ready for their morning pick-ups−adding to the already emissions-impacted school grounds.



Map of the Lebec region along I-5. An interactive version can be seen at http://goo.gl/maps/Mp5U

The Flying J truck stop smells bad with so many truck engines idling each night for hours. Concerned community members point to the continuous river of truck traffic on the freeway, worried about diesel soot particulates. Additionally, a cement manufacturing plant in the hills nearby, burns rubber tires and petroleum coke for fuel, is often mentioned in community concerns. The aggregate processing plant has been known to release mysterious ash onto nearby homes.

Problem Statement:

In 2004-2005, while TCW members sat on the board of the Mountain Communities Town Council, residents brought concerns about the possibility that the air quality in the mountain communities was being compromised.

Town Council member, Mary Ann Lockhart, who is also the president of the local Sierra Club group, expressed interest in sampling the air at the Middle School that sits adjacent to I-5 in the mountain community of Lebec. I-5 is one of California's major goods movement corridors. Parents reported their children were developing asthma-like symptoms while attending the middle school. According to data gathered by the California Health Kids Survey, 27% of fifth graders attending El Tejon Middle School reported being told they have asthma[4], compared to 20% of fifth graders in the Bakersfield area[5]. Children have even said their lungs hurt as they ran in the playground next to the freeway.

One woman, who wants to remain anonymous, lived very close to the freeway for four years. Over that time her breathing difficulties were exacerbated to the extent that her doctor advised her that a move was the answer to her illnesses.

Concerns were also raised about the Flying J Truck stop in Lebec along I-5 because the truck stop was not electrified. Many drivers park their trucks and idle all night long each night at this truck stop to keep air conditioning or heat in running in their cabs for sleeping, as well as keeping refrigeration units running in their trailers in order to maintain adequate temperature to preserve cargo. Electrifying the truck stop would allow the driver to plug in and use electricity to run the units in their trailers instead of idling their diesel engines.

Trucks parked at the Flying J truck stop usually idle overnight

Across the street from the truck stop are two trailer parks. Residents of the

[4] El Tejon Unified Elementary, California Healthy Kids Survey: Main Report, 2009 – 2010. http://chks.wested.org/resources/el_tejon_elem0910_main.pdf?1341868537

[5] Bakersfield City Elementary, California Healthy Kids Survey: Main Report, 2009 – 2010. http://chks.wested.org/resources/bakersfield_elem0910_main.pdf?1341855797

trailer parks mentioned suffering from a variety of chronic respiratory illnesses.

In addition to the freeway and the truck stop as sources of suspected air pollution, the town council heard reports and concerns about two facilities in the region reported to emit toxic pollution into the air. One of these facilities, approximately twenty miles from the middle school, is National Cement, a manufacturing facility that burns tires and petroleum coke for fuel in its process.

The other manufacturing facility is TXI in Lockwood Valley. TXI produces a building aggregate created by soaking mined clay from the local mountains in diesel fuel, and then burns the clay in high temperature kilns. The town council actually sponsored an air district hearing when the company reapplied for their Title V permit in 2005. People in the area reported strange illnesses, including cancers and some also said that their pets and/or livestock became sick and/or died unexpectedly.

The final source of air pollution visible to the residents of the mountain communities is a haze coming from the San Joaquin Valley and moving up the “Grapevine Pass”. This haze usually consists of ozone and particulate matter and gets trapped in narrow valley of the mountainous Grapevine Pass. The “Grapevine Pass” connects southern California with the San Joaquin Valley.

Community Monitoring

GCM training TCW on how to use the air monitor

Regulatory and environmental agency personnel often are not available at all hours to arrive on site and take samples during a pollution incident. Community led monitoring provides an opportunity for residents to document pollution incidents and take samples in addition to contacting agency personnel. Community pollution incident records, referred to as "pollution logs," filled out by impacted community members insure that records are maintained beyond regular business hours.

Community led monitoring engages the impacted community in record maintaining, site identification, operation of monitoring equipment, filling out necessary forms and shipping of the sample.

GCM trained the members of the TCW and other impacted community members to keep a record of pollution incidents identifying the residents' names, location, the nature and duration of the incident, the wind direction, health effects or property damage and how the incident was addressed - by a call to the regulatory agency, the polluting company or informative calls to other neighbors. Community members are also encouraged to take pictures and or use video camcorders to catch a visual image of the pollution.

The community input, through pollution logs and community meetings, helps determine potential sampling locations by better understanding what the day-to-day experience is and the nature of the pollution problem in relation to wind direction, pollution sources and neighborhood location. The areas with the most consistent pollution and records of the pollution are referred to as "hot spots." The majority of the sampling was conducted in the "hot spot" areas.

Project Timeline

While Linda MacKay was serving as president of the Town Council in 2005, she initiated an effort with the other council members to ask the air district if they would provide air quality monitoring in the region, since no official air monitoring had been done previously. However, when contacted, the air district said that the region did not meet the requirements to do air monitoring. The council unanimously agreed to write a letter to the California Air Resources Board (CARB) to ask if they would consider placing a monitor in the region near the middle school.

Air pollution coming up through the Grapevine Pass

CARB agreed to place a mobile air monitor that measured PM 2.5, PM 10, and ozone in the CalTrans sandlot adjacent on the east side of the Flying J truck stop. While monitoring took place from Feb of 2006 to Feb 2007, the

results on the particulate matter analysis were inconclusive. There were several high PM readings, but wild fires during that year of monitoring confounded the data.

Ozone, on the other hand, was found to be at very high levels. In fact, the ozone was worse in these mountain communities than parts of Bakersfield during that same time period and at higher levels than Burbank, California, part of the Los Angeles sprawl.

In 2009, the largest local corporation, Tejon Ranch, produced a Draft Environmental Impact Report (DEIR) for a housing development project they were proposing to build in Lebec. With the preparation of their DEIR, Tejon Ranch hired a consulting company to monitor the air in Lebec near the proposed project from 2006-2009. The air monitor measured nitrogen oxide (NO_X), sulfur oxides (SO_X), carbon monoxide, particulate matter (PM 10 and PM 2.5). Tejon's data also showed that the ozone in the Lebec area was at high levels. Below is a table showing ozone pollution compared to surrounding communities.

Table 4.3-6. Ambient Air Quality Monitoring Data Measured at Tejon Ranch

Pollutant Standards	2005	2006	2007
Ozone			
Maximum 1-hour concentration (ppm)	0.111	0.122	0.093
Maximum 8-hour concentration (ppm)	0.100	0.106	0.088
Number of days standard exceeded[a]			
CAAQS 1-hour (>0.09 ppm)	10	28	0
NAAQS 8-hour (>0.08 ppm)[b]	20	31	1
CAAQS 8-hour (>0.070 ppm)	69	71	69

Table 4.3-9. Ambient Air Quality Monitoring Data Measured at Peace Valley Road

Pollutant Standards	February 1, 2006, to March 31, 2007
Ozone (O_3)	
Maximum 1-hour concentration (ppm)	0.108
Maximum 8-hour concentration (ppm)	0.099
Number of days standard exceeded[a]	
CAAQS 1-hour (>0.09 ppm)	14
NAAQS 8-hour (>0.08 ppm)[b]	12
CAAQS 8-hour (>0.07 ppm)	57

Table 4.3-7. Ambient Air Quality Monitoring Data Measured at Arvin, Bakersfield, and Maricopa-Stanislaus Stations

	Arvin—Bear Mountain Blvd.			Bakersfield—California Ave.			Bakersfield—Golden State Hwy.			Maricopa-Stanislaus		
Pollutant Standards	2005	2006	2007	2005	2006	2007	2005	2006	2007	2005	2006	2007
Ozone (O_3)												
Maximum 1-hour concentration (ppm)	0.133	0.135	0.129	0.117	0.123	0.117	0.110	0.108	0.127	0.102	0.104	0.097
Maximum 8-hour concentration (ppm)	0.113	0.119	0.110	0.103	0.110	0.106	0.092	0.096	0.102	0.096	0.094	0.090
Number of days standard exceeded[a]												
CAAQS 1-hour (>0.09 ppm)	84	66	51	28	52	4	7	15	1	7	4	3
NAAQS 8-hour (>0.08 ppm)[b]	54	61	41	33	53	8	8	16	1	15	11	8
CAAQS 8-hour (>0.070 ppm)	113	125	120	92	104	49	48	62	26	71	64	47

In early 2010, the Watchdogs decided to make air quality monitoring a priority. Residents of the mountain communities assumed when moving to the area that the region had much cleaner air

than the Los Angeles air basin to the south or the San Joaquin air basin to the north. Because of the CARB air monitoring and monitoring completed by Tejon Ranch, the Watchdogs were aware that, at least in the Lebec mountain community near the Interstate, the ozone was at unhealthy levels.

But good particulate matter data was incomplete. Anecdotal information suggested that the brown sky was the particulate matter coming into the region up from the San Joaquin Valley through the Grapevine Pass just as the data previous sampling done by CARB and Tejon monitoring had shown that the ozone was moving up from the San Joaquin Valley floor.

In 2010 the Watchdogs contacted GCM to see if they could collaborate on an air monitoring project that could help the mountain communities. If problems were identified, the Watchdogs would also need help to resolve them and protect its residents.

In May 2010, the TCW and GCM jointly applied for a $25,000 grant through the Kern County Air Quality Mitigation Fund to do air quality monitoring in the mountain communities. In August 2010 the grant was awarded.

Community residents identifying 'hot spots' to consider as air monitoring locations

In October 2010, the TCW sponsored a community meeting followed by a two-day training to start their air monitoring project. During the training, the community was introduced to GCM and the work that GCM has done worldwide helping small communities to scientifically capture and log air quality in their own communities. Trainers from GCM solicited ideas for possible areas to monitor.

Trucks passing along I-5 right behind to the ball fields at Tejon Middle School

Approximately 20 people learned about the particulate matter monitor that would also measure diesel (elemental carbon/organic carbon) pollution. A subsequent training was held in March 2011.

The areas near I-5, such as the middle school, the Flying J truck stop, the trailer park opposite the truck stop, the communities near the TXI and National Cement plants were named as locations of concern. Some community members expressed an interest in knowing what the ozone levels were in the communities higher in elevation than Lebec, i.e., the villages of Frazier Park, Lake of the

Woods, Cuddy Valley, and Pine Mountain Club. Community members were also concerned about idling trucks and school busses in their neighborhoods. Maps were drawn to show areas of concern.

The actual monitoring for PM 2.5 started in March 2011 at a site near the Middle school next to the Interstate. Although it was requested several times by the TCW, school administrators for the district were resistant to allowing air monitoring on the middle school grounds. Therefore, TCW decided on the alternate site at Fort Tejon, just a half of a mile from the middle school.

After further research, GCM and TCW concluded that the majority of particulate pollution from the freeway could be present in the form of ultra-fine particles[6], smaller than the PM 2.5 particles that TCW was testing for. The PM monitor that the Watchdogs were using in this project did not have the capabilities to measure ultra-fine particles. Therefore the sampling switched focus slightly, from PM 2.5 monitoring to diesel (EC/OC), monitoring.

TCW using a trailer to site the monitor at the Fort Tejon parking lot next to I-5

After months of sampling, it became a hardship on whoever parked their car for the 24 hour period. Near the end of the project the Watchdogs purchased a trailer to site the monitor where monitoring needed to take place.

Within the year of the TCW air monitoring project, a Lebec resident who lived near the Lebec Post Office, about 350 feet from the freeway, contacted TCW. She said she had heard about our project and believed that her health was impacted because of the pollution she was being exposed to in such close proximity to the freeway. Within the four years she had lived there she had developed respiratory problems. She reported that her doctor told her it was probably because she lived so close to I-5.

Two diesel samples were taken at her residence. However, the woman moved and since TCW didn't have permission from the landlord to continue to take samples from this residence, TCW did the final four samples in the parking lot of the Lebec Post office across the street from her home.

During the project year it became clear that the Watchdogs didn't have the capacity or the funds to complete the original schedule of sampling. TCW had planned on taking heavy metal samples near both the TXI and National Cement plants, locations which would be extremely difficult to obtain access to monitoring locations. Additionally a lot of effort was spent trying to gain access to the middle school grounds for monitoring. Despite repeated requests and meetings with school officials, TCW was denied access to the school grounds to monitor the air quality.

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[6] Saywer, Robert, PhD. "Understanding the Potential Ultrafine Particle Pollution Problem and its Impact on California's Air Quality." California Air Resources Board. Ultrafine Particle Conference, April 30 – May 2, 2006, http://www.aqmd.gov/tao/ultrafine_presentations/Keynote_BobSawyer.pdf

Determining what to sample for:

Given the close proximity of the Lebec communities to the I-5 freeway, GCM and TCW chose to monitor for particulate matter 2.5 (PM 2.5) and Elemental Carbon/Organic Carbon (EC/OC), which is a test for diesel soot; and forty heavy metals (XRF).

As the air monitoring project progressed, GCM and TCW conducted further research on ozone and ultra-fine particle monitoring.

Sampling Equipment, Protocols & Project Design:

Standard Operating Procedures were developed and implemented in the monitoring project.

Samples for this report used a variety of standard and accepted methodologies by a certified laboratory for analysis. Particle samples were subjected to analysis for concentrations of PM 2.5 by pre and post weighing analysis by Chesterlabnet in Oregon. A portion of these samples were also subjected to analysis for metals by X-ray refractory technology (XRF).

In addition, other filter samples were analyzed for concentrations of diesel particulates by NIOSH method 5040 as Elemental Carbon as compared to Organic Carbon (EC/OC).

The Monitor

Mini Vol Portable Air Sampler

Various environmental agencies throughout the country recommend that a Mini Vol Portable Air Sampler produced by Airmetrics be employed while monitoring for particulate matter. The Mini Vol provides accurate and precise results, is easy to use, and can be moved from location to location allowing for a broader assessment of how toxic air contaminants might be distributed in the Lebec area.
The Mini Vol Portable Air Sampler samples ambient air for particulate matter (PM10, PM 2.5 or total suspended particulates - TSP) and/or non-reactive gases (CO, NOx). Airmetrics and the US EPA jointly developed the patented low-flow technology used in the Mini Vol. While not a US EPA Federal Reference Method (FRM) sampler, the Mini Vol provides results that closely approximate reference method data. Affordable and portable, the Mini Vol is ideal for saturation studies, emergency response situations, fugitive emissions, prescribed burning sampling, and urban air quality studies.

The Mini Vol is basically a pump unit that pulls air through a filter holder assembly, where particle size separation occurs by impaction. The flow of air can be adjusted and, in this case, has been set at 5 liters/minute. The particulate matter is collected on a 47mm filter. The filters are weighed pre and post exposure by a microbalance, accurate to one microgram, to determine the particulate concentration. The Mini Vol does not provide any real-time readout. Samples are sent to a lab that utilizes EPA approved methods for analysis.

The Mini Vol features include a seven day/six run programmable timer, an elapsed time meter, low flow and low battery shut-offs, and operation from rechargeable battery packs. The Mini Vol can sample for only one size of particulate at a time and can sample for PM10, PM2.5 or TSP depending on the nozzle attachment used.

At the end of a particulate sampling period, the filter holder and battery pack are replaced by a second filter holder and a second battery pack (two of each come standard with a new Mini Vol). Once a sample is collected, the exposed filter is sent to the lab for post-exposure weighing and analysis and a fresh, pre-weighed 47mm filter is placed into the filter holder for the next sample collection. Recharge of the spent battery is accomplished in about 16 hours using a universal transformer connected to a wall circuit. At certain sampling locations electrical power is available and the Mini Vol is simply plugged in during sampling periods.

Prior to leaving the vendor's shop, each Mini Vol sampler is calibrated using a Laminar Flow Element and a calibration curve traceable to NIST is included with each new sampler. The manufacturer requires an annual recalibration test to ensure Quality Control/Quality Assurance. The monitor used in this report was recalibrated by the manufacturer prior to commencement of the project.

Using the Monitor

An in-person, hands on training was conducted by GCM with each TCW volunteer using the monitor. This training is intended to ensure uniformity, consistency and Quality Control/Quality Assurance. Specifically it covers:

♦ An introduction to the monitor and its features.

♦ How to assemble the monitor, including how to attach the battery pack.

♦ How to assemble the intake nozzle assembly, how to distinguish the PM 2.5 from the PM10 assemblies, and what particle diameter assembly to use for this project.

♦ How to load the filter into the assembly without contaminating it in a clean environment. Sterile gloves are used and filters are loaded indoors to prevent contamination prior to testing.

♦ How to fit the nozzle on the pump.

♦ How to make sure the monitor is properly calibrated to ensure 5-liter/minute airflow.

♦ How to program the monitor to ensure it runs for a complete 24 hour cycle, including waiting and listening to ensure the pump starts up as programmed.

♦ How to remove the filter when the monitoring period is over—again using sterile gloves and conducting this operation indoors in a clean environment—and immediately placing the filter in the clean sterile holder it was shipped from the lab in.

♦ How to ensure proper custody by entering key information on the laboratory control sheet including: sample location, date and run times, relevant observations about wind direction, strength, etc., and signing and retaining a copy of the control sheet.

♦ Proper record keeping using field logs and chain of custody forms.

♦ All aspects of good Quality Control/Quality Assurance practices.

Volunteers were also provided with a copy of the Mini Vol manual written and updated by Airmetrics.

Samples were packaged with a field log data sheet, delivered to a Federal Express or US Mail, employee who signed the control sheet ensuring an unbroken chain-of-custody, and then mailed to Chesterlabnet in Oregon, for analysis using EPA- approved methods. Raw data sheets of the metals found in the samples are generally available within 10-15 business days.

In addition, volunteers had been instructed in how to document key monitoring variables, such as wind speed and direction, whether odors/dust are present, etc. and how to enter this information into a field log to be added to the laboratory data.

GCM conducted a total of two trainings to ensure that volunteers followed the Standard Operating Procedures and followed strict Quality Control/Quality Assurance measures in all monitoring activities. In addition, ongoing technical assistance through constant communication and support from GCM and the chemical analyst were a key part of the project.

Selecting Monitoring Locations

The community identified potential locations for the air monitors to be placed. Volunteers were trained and instructed in how to determine whether locations meet EPA siting criteria. All potential locations were visited prior to actual sampling to ensure they were not obstructed, that the monitor could be placed in a secure location, and that the site met the location criteria just described.

Volunteers were trained and instructed in how to determine when wind conditions were right and how to make an assessment, at the end of the monitoring period, about the consistency of the winds during the previous 24 hour period. While it is typical for wind direction to shift during a normal 24 hour period so that some of the time the wind may not be coming from the direction of the polluting location, ideal samples involved monitoring when the monitor was located downwind for most of the monitoring period.

Additionally, lower wind speeds were preferred to ensure monitoring was conducted when maximum particulate fallout could be expected.

Sample Plan

Original monitoring location on sign pole along I-5

The TCW air monitoring plan was to monitor PM 2.5 for 24 hours every six days for one year. The initial site was on a sign pole along I-5 in front of California State Park Fort Tejon. Since TCW was denied access to school grounds, this site was chosen after meeting with officials from Fort Tejon and CalTrans. The location is a half a mile from the school, as close as we could get to the site.

TCW President, Linda MacKay, was told that the organization had permission from the Park, but after collecting only three samples, she was informed by a CHP officer that TCW would have to get a permit from CalTrans to continue placing the monitor at that site. The Watchdogs sent in a permit request, but in the meantime, TCW placed the monitor on top of a parked car in the parking lot of Fort Tejon for 24 hours at a time to keep up the regular intervals of monitoring every six days. In order to prevent theft and tampering, the monitor was disguised by being placed in a dog carrier with the filter apparatus above the carrier level.

Air monitor disguised by the dog carrier while parked overnight in the Fort Tejon parking lot

Additionally, TCW monitored at the nearby truck stop (The Flying J), the Lebec post office and two residences, one near the freeway, and one near the Flying J truck stop.

TWC tested for PM 2.5, diesel (EC/OC) and heavy metals (XRF).

Discarded Samples

The data from samples that did not meet the above Standard Operating Procedures were not included in the final report.

Analysis of Data by third party

GCM and TCW sent the raw data sheets, chain of custody and field logs from the lab to Mark Chernaik, Ph.D., a third party expert, for calculation of 24 hour concentrations of PM 2.5, diesel particulate matter and metals.

Dr. Chernaik helps attorneys and citizens make effective use of scientific information pertaining to the environment. Dr. Chernaik received a Bachelor of Science degree in Biochemistry from the University of Massachusetts at Amherst and a Ph.D. in Biochemistry from Johns Hopkins University. His work has been published in the Proceedings of the National Academy of

Sciences, U.S.A, and the Journal of Biological Chemistry. He received his law degree from the University Of Oregon School Of Law in May 1993.

Dr. Chernaik provided his expert opinion as to the potential sources of each of the air pollutants in the data as well as potential health implications from exposure to these compounds.

Results

According to Dr. Mark Chernaik

The Lebec community is in the vicinity of the I-5 Highway, which connects the Central Valley of California with southern California. Approximately 70,000[7] vehicles, of which an estimated 18,000 are large trucks with diesel-fuel engines, travel through a narrow mountain pass, through the communities of Gorman and Lebec, California. Each day, several hundred trucks, many of them allowing their engines to idle overnight, park at the Flying J truck stop at 42810 Frazier Mountain Park Road.

Data collected for this report indicates that the Lebec community, including a school with 240 students, is heavily impacted by diesel particulates from heavy truck traffic along the Interstate highway. The levels found in the samples represent a serious health threat to heart and respiratory systems of people in the area. Exposure to diesel pollution in this area could lead to hospitalization, heart attacks and death.

The air quality data in this report consists of 51 air samples collected over a period of slightly more than a year, from March 11th, 2011 to March 30th, 2012. Thirty-three of the 51 samples were analyzed for very fine PM 2.5 by gravimetric analysis. Twenty-six of the 51 samples were analyzed for EC/OC and total carbon (TC) content by NIOSH method 5040 using an OC-EC Aerosol Analyzer. Nineteen of the 51 samples were analyzed for trace elements, including toxic metals, by XRF. Some samples were analyzed for more than one type of parameter.

Vehicle exhaust, primarily diesel exhaust, is the predominant source of EC in ambient air.

- When EC levels are above 1 microgram per cubic meter ($\mu g/m^3$), then one can conclude that this location is an area impacted by diesel engine emissions. [8]

- When 24 hour EC levels at a location are above 1.36 $\mu g/m^3$, then they are high enough to be associated with an excess risk of cardiovascular mortality two and three-days post exposure.[9]

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[7] California Dept. of Transportation, 2010 AADT, Los Angeles/Kern Co. Line (Line 637). http://traffic-counts.dot.ca.gov/

[8] Even in urban areas, levels of EC in air samples almost never exceed 1 $\mu g/m^3$ unless the sample is within a few hundred feet of road traffic. See: "Traffic emissions of elemental carbon (EC) and organic carbon (OC) and their contribution to PM2.5 and PM10 urban background concentrations (figures 2-12 and 2-13 on page 25)." http://www.mnp.nl/bibliotheek/rapporten/500099011.pdf

- When 24 hour EC levels at a location are above 0.838 μg/m^3, then they are high enough to be associated with an excess risk of cardiovascular and respiratory hospitalizations on the day of exposure.[10]

Eight of the 26 measurements of EC levels were made at the ***Fort Tejon # 2 location near the El Tejon Middle School (34.8748^o N, 118.893^o W***). EC levels at this location averaged 1.55 μg/m^3. Therefore, one can conclude that this location is an area impacted by diesel engine emissions.

- On five of the eight sampling dates, EC levels at the Fort Tejon #2 location exceeded 1.36 μg/m^3; therefore, on these dates, persons spending time outdoors at this location would be subject to an elevated risk of cardiovascular mortality two and three-days post exposure; and an elevated risk of cardiovascular and respiratory hospitalizations on the day of exposure.
- On two of the eight sampling dates, EC levels at the Fort Tejon #2 location were between 0.838 μg/m^3 and 1.36 μg/m^3. On these two dates, persons spending time outdoors at this location would be subject to an elevated risk of cardiovascular and respiratory hospitalizations on the day of exposure.
- On only one of the eight sampling dates was the EC level below 0.838 μg/m^3. On this date (November 19th, 2011), the Chain of Custody form indicates precipitation (rainfall) that might account for the lower EC level at this located compared to the other seven samples.

All four of the EC levels at the ***Lebec Post Office Parking Lot location at 2132 Lebec Road*** were between 0.838 μg/m^3 and 1.36 μg/m^3. On these dates, persons spending time outdoors at this location would be subject to an elevated risk of cardiovascular and respiratory hospitalizations on the day of exposure.

- One of the two samples collected at ***a residential location across the street from the post office*** had an EC level between 0.838 μg/m^3 and 1.36 μg/m^3. On this

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[9] In 2008, scientists from the California Office of Environmental Health Hazard Assessment (OEHHA) published a study about the relationship between cardiovascular mortality and the chemical composition of pollutant levels in ambient air in California. These scientists examined the relationship between cardiovascular mortality and the interquartile range (IQR = the difference between the third and first quartiles) of EC levels. The scientists found strongly significant associations between excess risk of cardiovascular mortality two and three-days post exposure and the IQR for EC. The average level of EC in ambient air samples in the study was 0.966 μg/m^3. The IQR for EC was 0.795 μg/m^3. In this study, the 4th quartile level of EC was 1.36 (0.966 + [0.795/2]) μg/m^3. Ostro, et al. (2008) "The impact of components of fine particulate matter on cardiovascular mortality in susceptible subpopulations," *Occup. Environ. Med.*, 65;750-756.

[10] In 2009, scientists from Yale University, the Johns Hopkins University School of Public Health and the Keck School of Medicine, University of Southern California, published a study about the relationship between cardiovascular and respiratory hospitalizations, and the chemical composition of pollutant levels in ambient air in 106 different counties across the United States. These scientists examined the relationship between cardiovascular and respiratory hospitalizations and the IQR of EC levels. The scientists found strongly significant associations between excess risk of cardiovascular and respiratory hospitalizations and the IQR for EC. The average level of EC in ambient air samples in the study was 0.715 μg/m^3. The IQR for EC was 0.245 μg/m^3. In this study, the 4th quartile level of EC was 0.838 (0.715 + [0.245/2]) μg/m^3. Bell, et al. (2009) "Hospital Admissions and Chemical Composition of Fine Particle Air Pollution," *Am J Respir Crit Care Med*, 179:1115–1120.

date (January 18th, 2012), persons spending time outdoors at this location would be subject to an elevated risk of cardiovascular and respiratory hospitalizations on the day of exposure. On the other date (December 15th, 2011), this location had an EC level of 0.8 µg/m^3.

All of the six samples collected at the ***Carlson's Residence within the Frazier Mt. mobile home park*** had EC levels below 0.838 µg/m^3 (five of the six EC levels at this location were below the detection limit). This is a location that does not seem to be impacted by emissions from diesel-fuel engines. Similarly, one sample was collected at the ***Frazier Mt. mobile home park location*** and it had an EC level below 0.838 µg/m^3. This is also a location that does not seem to be impacted by emissions from diesel-fuel engines. Because there are days when EC levels were elevated at the Fort Tejon #2 location and/or the parking lot of the post office than the truck stop, yet the wind direction was toward the south, this supports the hypothesis that emissions from trucks traveling up and down I-5 are more responsible for elevated EC levels at these locations than trucks idling at the truck stop.

The low EC levels in the samples collected at the mobile home park could have been because, on the days samples were taken, heavy winds were blowing diesel emissions away from the truck stop. Still, there is at least one date (8-Dec-11) when calm winds were blowing from the south and yet still, EC levels at the mobile park were below the detection limit however in a 24 hour period wind direction could have changed significantly.

Only one of the five samples collected at the ***Motel 6 parking lot adjacent to the Flying J truck stop (51541 N Peace Valley Rd, Lebec)*** had an EC level between 0.838 µg/m^3 and 1.36 µg/m^3. On this date (December 6th, 2011), persons spending time outdoors at this location would be subject to an elevated risk of cardiovascular and respiratory hospitalizations on the day of exposure. Four of the five samples collected at this location had EC levels at or below 0.8 µg/m^3."

Recommendations

Reviewing the results from the community air monitoring project of this past year TCW and GCM make these recommendations:

1. **Trees should be planted near the freeway to reduce emission exposures**

   Studies have shown that planting trees between a major roadway and a sensitive site, like school grounds, can potentially reduce vehicle emissions to that site by up to 30%.[11] The monitoring data on the diesel soot (EC/OC) was consistent and alarming at the middle school site at Fort Tejon. The EC levels were at high enough levels to put the children attending and staff who work at the school at risk potentially, not only on the days they were exposed but possibly for up to two to three days after the exposure.

   There are also fields next to the middle school that the community uses for children's soccer and ball games. Because of the serious health risk from the EC emissions coming from the Interstate, and the nature of the athletic activities where the children run and take in more air as they breathe than they would in less active activities, we highly recommend that the ball fields are moved to an area much farther from the freeway. Perhaps in the fields next to the county park in Frazier Park.

2. **Scheduling play periods at the Middle School to avoid times of high readings**:

   Because the project did not measure any significant PM 2.5 within our samples, we would like to draw attention to the data from the San Joaquin Valley air district monitor on Tejon Ranch property in Lebec from this last winter. Looking at a full 24 hour average samples, there seems to be no problem involving particulate matter. That is the standard by which the air district requires to see if a monitor is showing that a region is outside a healthy range. However, the Tejon monitor showed several spikes in the past winter months of four to five hour periods when the PM 2.5 was at levels that could put people at unhealthy risk if they were in the open air during those time periods.

   We recommend that the school monitor the live data, from the air monitor in Lebec, that is maintained on the San Joaquin Valley air district's website and keep children indoors when the monitor in Lebec is witnessing spikes in PM 2.5. This is especially important in the afternoon during the winter months, where recess and play periods should be scheduled accordingly to keep the children indoors when levels are at their highest.

[11] SciVerse/Science Direct. Atmospheric Environment. Oct. 2008, "Impacts of Noise Barriers on Near Road Air Quality". http://www.sciencedirect.com/science/article/pii/S1352231008005311

3. **Replant trees near businesses close to the Freeway**

At the location in Lebec, near the Lebec Post Office, we recommend that trees that were recently removed behind the post office and antique store be replanted to reduce the emission exposure of the residents who live near this area.

The trees that used to separate the freeway from community centers, like the Lebec post office, have been removed

4. **Electrify the Flying J Truck Stop**

Ideally the truck stop should be electrified to stop the potential health risk to the surrounding residents. Truckers report anecdotally that they save money paying the charges for electricity rather than the cost of gas necessary to run the engines.

Extremely high winds that prevail near the truck stop prevented adequate sampling. Therefore, there were no air monitoring samples to show the area near the Flying J truck stop was impacted by diesel soot. However, due to the vast number of trucks that idle at the truck stop each night, it is logical that diesel particulates are impacting the people who live nearby.

5. **Ultra-Fine Particle Analysis should be Performed by The San Joaquin Air District**

Further ultra-fine particulate analysis is needed because standard PM 2.5 monitoring does not properly identify ultra-fine particles We recommended that if there is future funding available that further monitoring of ultra-fine particles be carried out.

6. **Reduce pollution from existing truck transportation**:
(as listed in the Trade, Health and The Environment Impact Project)[12]

- Monitor air pollution from highways. More air pollution monitors should be established along I-5. Monitoring for diesel particulates and ultra-fine particulate matter should be included in what government and health agencies report. If air pollution levels exceed health based thresholds, nearby homes, businesses and schools should be notified.
- Set stronger air quality standards for locations near highways. Air quality regulators should set more protective standards for communities bordering highways.
- Initiate, continue and strengthen clean truck programs. Clean Truck Programs like those adopted by the Ports of Los Angeles and Long Beach reduce emissions by requiring cleaner trucks at ports, but goods are often transferred back to dirtier trucks for longer range transport. To achieve air quality improvements, regulations should require

[12] Trade, Health and The Environment Project. "Reducing Air Emissions Associated With Goods Movement: Working Towards Environmental Justice ".
http://hydra.usc.edu/scehsc/web/Resources/Reports%20and%20Publications/Resources-%20Reports%20and%20Publications.html

employers of truck drivers to be responsible for purchasing and maintaining new clean trucks.

- Schools, health facilities and residences near truck routes should be allocated resources to address health impacts.
- Zone and plan to keep trucks away from population areas. Cities and counties need stricter rules to separate highways and truck routes from residences, schools and other sensitive receptors.

7. **Increase local government capacity to regulate and plan in tough economic times**.

   Local governments are responsible for land use planning and decisions on how land is used, whether a city builds a new park or a housing development. City governments can also weigh in on whether they support or oppose new freight transportation facilities, such as a rail yard or a highway expansion. Cities and counties across the country, however, face increasing economic and budgetary challenges. The result has been layoffs, furloughs, and elimination of environmental and regulatory enforcement programs that leave local governments with little capacity and limited political will to push back against powerful port expansion and freight transportation development agendas. New partnerships with the nonprofit and philanthropic sector, when deeply rooted in the public sector, can provide local authorities more tools and resources to address the negative health and environmental impacts of freight transportation.

Conclusion:

Data collected by TCW during the monitoring period of March 2011 through March 2012 documents levels of unsafe air quality in the Lebec and Frazier Park areas due to increased diesel truck traffic along I-5, which serves a the major transportation corridor for California.

This air pollution impacts schools and community centers that provide services to sensitive populations like children and the elderly, which are already at higher risk of negative health effects due to their increased sensitivity to hazardous particulate matter. These recommendations would serve to improve air quality and le associated serious health risks.

GCM and TCW look forward to working with local, state and national leaders and agencies to further the discussion between residents and governmental agencies in efforts to reduce serious toxic exposure to the air pollution associated with the diesel truck traffic from I-5.

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Lyon, France: After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as carcinogenic to humans (Group 1), based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

Background:
In 1988, IARC classified diesel exhaust as probably carcinogenic to humans (Group 2A). An Advisory Group which reviews and recommends future priorities for the IARC Monographs Program had recommended diesel exhaust as a high priority for re-evaluation since 1998.
There has been mounting concern about the cancer-causing potential of diesel exhaust, particularly based on findings in epidemiological studies of workers exposed in various settings. This was re-emphasized by the publication in March 2012 of the results of a large US National Cancer Institute/National Institute for Occupational Safety and Health study of occupational exposure to such emissions in underground miners, which showed an increased risk of death from lung cancer in exposed workers (1).

Evaluation:
The scientific evidence was reviewed thoroughly by the Working Group and overall it was concluded that there was sufficient evidence in humans for the carcinogenicity of diesel exhaust. The Working Group found that diesel exhaust is a cause of lung cancer (sufficient evidence) and also noted a positive association (limited evidence) with an increased risk of bladder cancer (Group 1). The Working Group concluded that gasoline exhaust was possibly carcinogenic to humans (Group 2B), a finding unchanged from the previous evaluation in 1989.

Public health:
Large populations are exposed to diesel exhaust in everyday life, whether through their occupation or through the ambient air. People are exposed not only to motor vehicle exhausts but also to exhausts from other diesel engines, including from other modes of transport (e.g. diesel trains and ships) and from power generators. Given the Working Group's rigorous, independent assessment of the science, governments and other decision-makers have a valuable evidence-base on which to consider environmental standards for diesel exhaust emissions and to continue to work with the engine and fuel manufacturers towards those goals. Increasing environmental concerns over the past two decades have resulted in regulatory action in North America, Europe and elsewhere with successively tighter emission standards for both diesel and gasoline engines. There is a strong interplay between standards and technology – standards drive technology and new technology enables more stringent standards. For diesel engines, this required changes in the fuel such as marked decreases in sulfur content, changes in engine design to burn diesel fuel more efficiently and reductions in emissions through exhaust control technology. However, while the amount of particulates and chemicals are reduced with these changes, it is not yet clear how the quantitative and qualitative changes may translate into altered health effects; research into this question is needed. In addition, existing fuels and vehicles without these modifications will take many years to be replaced, particularly in less developed countries, where regulatory measures are currently also less stringent. It is notable that many parts of the developing world lack regulatory standards, and data on the occurrence and impact of diesel exhaust are limited.

Conclusions:
Dr Christopher Portier, Chairman of the IARC working Group, stated that "The scientific evidence was compelling and the Working Group's conclusion was unanimous: diesel engine exhaust causes lung cancer in humans." Dr Portier continued: "Given the additional health impacts from diesel particulates, exposure to this mixture of chemicals should be reduced worldwide."(2) Dr Kurt Straif, Head of the IARC Monographs Program, indicated that "The main studies that led to this conclusion were in highly exposed workers. However, we have learned from other carcinogens, such as radon, that initial studies showing a risk in heavily exposed occupational groups were followed by positive findings for the general population. Therefore actions to reduce exposures should encompass workers and the general population." Dr Christopher Wild, Director, IARC, said that "while IARC's remit is to establish the evidence-base for regulatory decisions at national and international level, today's conclusion sends a strong signal that public health action is warranted. This emphasis is needed globally, including among the more vulnerable populations in developing countries where new technology and protective measures may otherwise take many years to be adopted."