

Memo

To: Administrator, Federal Highway Administration
From: Michael P. Walsh
Date: June 12, 2007
Re: Support for Petition requesting a Supplemental EIS to reconsider approval of the Intercounty Connector Project in Maryland

Particulate emissions from vehicles are widely recognized as the source of serious public health concerns. Studies have shown that increases in daily particle levels are followed by increases in daily deaths in many cities around the world. For example, in Mexico City, several studies have found evidence of a 2.5% to 3.0% increase in mortality associated with a 10 $\mu\text{g}/\text{m}^3$ increase of PM_{10} concentrations. There is also growing evidence of cardiovascular effects. A recent study of 691 patients in Augsburg Germany who had suffered heart attacks, found a near-tripling of the risk of heart attacks among those who had spent time in traffic 2 hours before the attack.^a Longer term exposures—years or even decades—are equally dangerous: in a study published earlier this year, when researchers analyzed data from the long term Women's Health Initiative Study of 65,000 women initiated in 1994, they found that a 10 $\mu\text{g}/\text{m}^3$ increase of PM_{10} concentrations resulted in a 76 percent increase in deaths from cardiovascular disease.^b

In addition to their linkage to death, fine particles are associated with a litany of lesser ills, including runny or stuffy noses, sinusitis, sore throat, wet cough, head colds, hay fever, burning or red eyes, wheezing, dry cough, phlegm, shortness of breath, and chest discomfort or pain, as well as hospital admissions for asthma and bronchitis. Increases in fine particle levels are accompanied by higher rates of chronic cough, asthma, and emphysema. Increases in fine particle concentrations have been linked to increases in incidence of bronchitis and chronic cough in school children, increases in emergency room visits and increases in hospital admissions.

^a "Exposure to Traffic and the Onset of Myocardial Infarction", Annette Peters, Ph.D., Stephanie von Klot, M.P.H., Margit Heier, M.D., Ines Trentinaglia, B.S., Allmut Hörmann, M.S., H. Erich Wichmann, M.D., Ph.D., and Hannelore Löwel, M.D., for the Cooperative Health Research in the Region of Augsburg Study Group, *New England Journal of Medicine*, N Engl J Med 2004;351:1721-30.

^b "Long-Term Exposure to Air Pollution and Incidence of Cardiovascular Events in Women", Kristin A. Miller, M.S., David S. Siscovick, M.D., M.P.H., Lianne Sheppard, Ph.D., Kristen Shepherd, M.S., Jeffrey H. Sullivan, M.D., M.H.S., Garnet L. Anderson, Ph.D., and Joel D. Kaufman, M.D., M.P.H., *N Engl J Med* 2007;356:447-58.

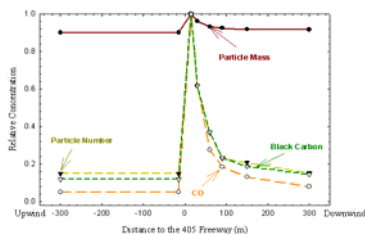
The strongest evidence for ambient PM exposure health risks is derived from epidemiological studies. Many epidemiological studies have shown statistically significant associations of ambient PM levels with a variety of human health endpoints in sensitive populations, including mortality, hospital admissions and emergency room visits, respiratory illness and symptoms, and physiologic changes in mechanical pulmonary function.

Even these data may not adequately reflect the severity of the air pollution problem. In revising its air quality guidelines recently, the World Health Organization noted the following:^c

“The evidence on airborne PM and public health is consistent in showing adverse health effects at exposures experienced by urban populations in cities throughout the world, in both developed and developing countries. The range of effects is broad, affecting the respiratory and cardiovascular systems and extending to children and adults and to a number of large, susceptible groups within the general population. The risk for various outcomes has been shown to increase with exposure and there is little evidence to suggest a threshold below which no adverse health effects would be anticipated. In fact, the lower range of concentrations at which adverse health effects has been demonstrated is not greatly above the background concentration which has been estimated at 3-5 $\mu\text{g}/\text{m}^3$ in the United States and Western Europe for particles smaller than 2.5 micrometer, PM_{2.5}. The epidemiological evidence shows adverse effects of particles after both short-term and long-term exposures.”

In addition to PM_{2.5} and PM₁₀, as noted above ultra fine particles (UF) have recently attracted significant scientific and medical attention. The WHO notes that “While there is considerable toxicological evidence of potential detrimental effects of UF particles on human health, the existing body of epidemiological evidence is insufficient to reach a conclusion on the exposure/response relationship to UF particles. Therefore no recommendations can be provided as to guideline concentrations of UF particles at this point.” However, while the precise level remains difficult to set, it is clear that a growing number of health experts believe that the number of ultrafine particles is the real health culprit and this is expected to receive increasing regulatory attention.

Figure 1: Relative Pollutant Concentrations vs. Distance from I-405 Freeway in Los Angeles (Zhu et al., 2002a)



Urban areas that have high traffic thoroughfares or freeways should be especially concerned. As shown in Figure 1 from a recent study in Los Angeles, people who live within a few hundred meters of heavily traveled roadways carrying diesel and other vehicles are exposed to elevated levels of particles including large numbers of ultrafines. In this particular study, people living or working even 200 meters downwind of the roadway were being exposed to elevated levels of black carbon and ultrafine particles as well as PM mass.

I highlight these health concerns to emphasize that estimates of PM emissions from roadways and associated air quality levels are critically important and must be accurate. Estimates of PM levels from vehicles based on the US EPA Mobile 6.2 Model are inherently low. This model does not include the effects of high load, high acceleration driving which

^c “WHO air quality guidelines global update 2005”, Report on a working group meeting, Bonn, Germany, 18--20 October 2005

tends to increase PM emissions. Nor does it correct for temperatures in spite of higher PM levels in winter. Other important factors not yet accounted for include cold starts, leaking injectors, deteriorated piston rings, and sensor failures. As a general rule, any failure mode or operating mode that tends to increase fuel consumption also tends to increase PM emissions. As a general matter, Mobile 6.2 does not account for these conditions and tends to significantly understate PM emissions.

Because the adverse health effects from PM are so severe, it is critically important that any impact assessment of a major new highway account for the conservatism in the model.

Curricula Vitae

Michael P. Walsh is a mechanical engineer who has spent his entire career working on motor vehicle pollution control issues at the local, national and international level. For the first half of his career, he was in government service, initially with the City of New York and subsequently with the US Environmental Protection Agency. With each, he served as Director of their motor vehicle pollution control efforts. Since leaving government, he has been an independent consultant advising governments and industries around the world. In addition he currently co-chairs the US EPA's Mobile Sources Technical Advisory Subcommittee and is actively involved in projects in Brazil, Hong Kong, Mexico, Viet Nam, and China. Currently he serves on the Executive Council of the Clean Air Initiative (CAI) – Asia and is a member of the Steering Committee of the CAI-Asia China Project. He is also a member of the National Academy of Science's Committee on Energy Futures and Air Pollution in Urban China and the United States. Michael P. Walsh was selected as the first recipient of the U.S. Environmental Protection Agency Lifetime Individual Achievement Award for "outstanding achievement, demonstrated leadership, and a lasting commitment to promoting clean air". More recently, he received the California Air Resources Board's "Haagen Smit" award for his "global efforts towards mobile source emissions reduction". He has just been selected as a MacArthur Fellow for "extraordinary originality and dedication".

MICHAEL P. WALSH

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OBJECTIVE
To assist governments in designing or implementing programs to address motor vehicle related pollution or energy problems.
SKILLS
Demonstrated proficiency in designing and managing motor vehicle pollution control and energy programs. Extensive background in all technical phases of motor vehicle pollution and energy problems at the local, national and International level. Unique policy overview regarding global motor vehicle air pollution and energy issues. Expertise in working with many countries around the world in designing and implementing optimal motor vehicle air pollution control programs.
EDUCATION
Bachelor of Science (Mechanical Engineering), Manhattan College, New York, 1966 Misc. graduate combustion courses, Princeton University, New Jersey, 1969-70.
EXPERIENCE

1981 to Present: Technical Consultant

Clients have included American Lung Association, Asian Development Bank, Congressional Office of Technology Assessment, Conservation Foundation, Corning International, Envirotech, League of Women Voters, Manufacturers of Emission Controls Association, NESCAUM, Organization For Economic Cooperation and Development (OECD), Systems Control, United Nations Environment Program, United States Senate Committee on Environment and Public Works, the World Resources Institute, the Environmental Protection Agencies of Brazil, Hong Kong, Mexico, Norway, Sweden, Switzerland, Thailand, Taiwan among others with efforts directed at evaluations of costs and benefits of motor vehicle emission standards, design of emission control programs in developing countries, alternative compliance approaches, analysis of Inspection and Maintenance programs to improve in-use vehicle emissions performance, alternative fuels and the need for control of diesel particulate. Recent efforts have focused on Southeast Asia for the World Bank, UNIDO and the Asian Development Bank.

1978 to 1981: Deputy Assistant Administrator, Mobile
Source Air Pollution Control, U.S.
Environmental Protection Agency

Directed U.S. program of standard setting, technology assessment, test procedure development, Certification, fuel economy measurement, and technical assistance to States in implementing motor vehicle Inspection and Maintenance programs. Responsible for developing the first diesel particulate standard in the world. Major EPA I/M effort initiated.

1977 to 1978: Special Assistant to Assistant
Administrator for Air, Noise and
Radiation, U.S. Environmental
Protection Agency

Principal advisor to Assistant Administrator on technical and policy issues related to State Plans for achieving health based air quality standards. Involved in air quality standard setting, air quality monitoring, reasonable controls on sources of pollution, etc.

1974 to 1977: Chief, Technical Support Branch,
Office of Enforcement, U.S.
Environmental Protection Agency

Lead the technical effort in mobile source enforcement related to testing and data handling in support of Recall and Assembly Line test programs as well as Inspection and Maintenance. Conducted comprehensive review of motor vehicle control program as part of strategy development.

1970 to 1974: Director, Bureau of Motor Vehicle Pollution
Control, City of New York, Department of Air
Resources Department

Responsible for New York City's motor vehicle pollution control effort with particular focus on the taxicab and truck problems.

AWARDS

Selected for Meritorious Rank in the U.S. Senior Executive Service, 1980.

Lloyd L. Withrow Distinguished Speaker Award from the Society of Automotive Engineers, 1999.

First recipient of the U.S. Environmental Protection Agency Thomas W. Zosel Outstanding Individual Achievement Award for outstanding achievement, demonstrated leadership, and a lasting commitment to promoting clean air, 2000.

California Air Resources Board's "Haagen Smit" award for his "global efforts towards mobile source emissions reduction, 2003.

MacArthur Fellow, 2006

MEMBERSHIPS

Society of Automotive Engineers

Air and Waste Management Association

American Association for the Advancement of Science

ADVISORY GROUPS

American Lung Association, National Action Panel on the Environment

Past Chairman, World Bank External Advisory Panel on Mexico City Transport/Air Quality Management Program

South Coast Air Quality Management District, Technology Advancement Office, Clean Fuels Advisory Committee

Past Chairman, Inspection and Maintenance Peer Review Panel, California Air Resources Board &

California Senate (1994)

Past Member, National Research Council, Transportation Research Board, Committee for the Study of

Public Policy for Surface Freight Transportation

Past Member, Expert Advisory Panel, Tehran Transport Global Environment Facility Project Co Chair, US Environmental Protection Agency Sub Committee on Mobile Source Air Pollution Control

Past Chairman, International Expert Advisory Panel, China National Environmental Protection Agency

Past Member, National Research Council, Transportation Research Board, Committee for the Study of

Transportation Options for Megacities in Developing Nations, Panel on Transportation Options

Member, International Advisory Board, Wuppertal Institute for Climate, Environment & Energy

Past Member, Transportation Working Group, China Council for International Cooperation and

Environmental Development(CCICED)

Past Member, National Academy of Engineering, Panel on the Future of the Automobile in China

Past Member Independent Review Panel for US 2007 Heavy Duty Standards & Low Sulfur Fuels

OTHER

Editor of Car Lines, an International Newsletter Dealing With Motor Vehicle Pollution Control
and Energy Issues
Invited Lecturer at several universities including Yale, Harvard, Johns Hopkins University.

Married
3 Children, 1 Grandchild
Date of Birth - 8/17/43
US Citizen

Selected Papers Authored or Co-Authored

1. "Air/Fuel Ratio by Exhaust Gas Analysis: Methods and Instrumentation," Cities Service Oil Company, June 1969.
2. "High Compression-Is It Worth It?" Cities Service Oil Company, July 1969.
3. "Air Pollution and the Automobile: A Review," Cities Service Oil Company, January 1970.
4. "The Effect of Heavy Gasoline Components on Exhaust Composition," Cities Service Oil Company, May 1970.
5. "Evaluation of Standard and Low Compression Vehicles During Mileage Accumulation On Unleaded Fuels," Cities Service Oil Company, December 1970.
6. "The Effect of Automotive Emission Requirements On Gasoline Characteristics", Doelling, Gerber and Walsh, ASTM, April 1971
7. "Problems Associated With Air Quality Control Region Implementation Plans," Fensterstock, Ketcham and Walsh, The Relationship of Land Use and Transportation Planning to Air Quality Management, Ed. George Hagevik, May 1972.
8. "New York Metropolitan Area Air Quality Implementation Plan: Transportation Controls", April 1973
9. "An Evaluation of the Oxidation Catalyst on Light Duty Vehicles", June 1974
10. "The Need For And Benefits Of Inspection and Maintenance Programs For In-Use Motor Vehicles," EPA, November 1976
11. "An Analysis of Alternative Motor Vehicle Emission Standards", U.S. Department of Transportation, Environmental Protection Agency, Federal Energy Administration, May 1977.
12. "Emissions From Catalyst Cars Beyond 50,000 Miles And The Implications For The Federal Motor Vehicle Control Program," Walsh and Nussbaum, EPA, SAE Technical Paper Series, Number 780027, February 27-March 3, 1978.
13. "The Clean Air Act Amendments and Motor Vehicle Inspection/Maintenance," Journal of the Air Pollution Control Association, Volume 29, Number 3, March 1979.
14. "Impact of City Buses on Urban Air Quality," Testimony at Public Hearing of the Standing Committee on Corporations and Authorities, New York City, May 18, 1979
15. "Future Trends In The Control Of Emissions From Motor Vehicles", Walsh and Kittredge, SAE # 801359.
16. "Health Aspects of Control Devices," Bulletin of the New York Academy of Medicine, Vol. 56, Number 9, November-December 1980.
17. "Statement of Michael P. Walsh Before the National Commission on Air Quality," November 14, 1980.
18. "Analysis of HR #4400 to Amend the Clean Air Act, The 'Traxler Bill'," MECA, September 15, 1981.

19. "Testimony of Michael P. Walsh Presented to the House of Representatives Subcommittee on Health and the Environment," September 21, 1981.
20. "Alternative Fuels and Fuel Additives", UNEP/WHO Inter-Regional Workshop On Air Pollution From Motor Vehicles, Moscow, October, 1981
21. "Automobile Emission Standards for Carbon Monoxide and Nitrogen Oxides," October 28, 1981.
22. "Motor Vehicle Emissions of Nitrogen Oxides", A Report to the Office Of Technology Assessment, November 30, 1981.
23. "Statement of Michael P. Walsh Before the State of California Air Resources Board, Impact of Increased Diesel-Powered Motor Vehicles in California," March 25, 1982.
24. "Point...And Counterpoint, The Case for a One-Gram Auto NOx Standard," The Environmental Forum, Volume 1, Number 1, May 1982.
25. "The Need For and Benefits From Inspection and Maintenance Programs", The Environmental Forum, Volume 1, Number 3, Sept. 1982.
26. "Discussion Paper On Acid Deposition," World Resource Institute, 1982
27. "The Benefits and Costs of Light Duty Diesel Particulate Control", SAE Paper 830179, March 1983
28. "Issue Paper on Automobile Emission Standards: 1983 Versus 1980," The University of Toledo Law Review, 1983
29. "Draft Environmental Guidelines On The Diesel Vehicle", Clavel and Walsh, United Nations Environment Program, March 1983
30. "Motor Vehicle Air Pollution and Lead-Free Gasoline, The United States Experience," BEUC and the EEB Conference, May 10,11 1983.
31. "The Advantages of Removing Lead From Gasoline and Using Catalytic Converters to Control Vehicle Exhaust Pollution," October, 1983.
32. "Heavy Duty Trucks and Buses - The Pollution Control Challenge For The Eighties", Air Pollution Control Association Speciality Conference, Kansas City, February, 1984.
33. "The Costs and Benefits of Diesel Particulate Control II", SAE Paper 840177, March 1984.
34. "Congress and the Clean Air Act: the Critical Motor Vehicle Issues", Air Pollution Control Association, Government Affairs Seminar, March, 1984.
35. Testimony On The Need For And Benefits of More Stringent Nitrogen Oxides Standards For Automobiles In Canada, before the Sub-Committee On Acid Rain, House of Commons, Canada, March, 1984.
36. "Gridlock and the Clean Air Act: The Critical Motor Vehicle Issues", 10th Annual North American Motor Vehicle Emissions Control Conference, New York, April, 1984.

37. "The U.S. Experience in Motor Vehicle Air Pollution Control - A Regulatory Success Story.", Walsh and Howitt, Eighth International Clean Air Conference, Melbourne, Australia, May 1984.
38. "Motor Vehicle Emissions Control: Spotlight On The Compliance Program", League of Women Voters Education Fund, July 1984.
39. "The Costs and Benefits of Gasohol for Denver, Colorado", State of Colorado Department of Health, December 1984.
40. "Motor Vehicle Air Pollution in Brazil", A Report to the Companhia De Tecnologia De Saneamento Ambiental (CETESB), October 1984.
41. "Global Trends in Motor Vehicle Air Pollution Control", SAE # 850148, February 1985.
42. "The Benefits and Costs of Diesel Particulate Control III - The Urban Bus", SAE #850148, February 1985.
43. "Motor Vehicles and Long Range Transport of Pollutants - A Growing Global Problem", Moore and Walsh, SAE # 851209, May 1985.
44. "The U.S. Motor Vehicle Emissions Compliance Program - Should Recall Be Scrapped?", SAE # 851264, May 1985.
45. "Other Nations Phasing Down Lead In Gas", EPA Journal, Vol. 11, Number 4, May 1985.
46. "Toxic Pollutants From Motor Vehicles", Presented at the Conference On Toxic Air Pollutants, State And Local Air Pollution Administrators, October 1985.
47. "Worldwide Trends of Diesel Particulate Regulation And The Development Status of Diesel Particulate Control Technologies", Presented in Kawasaki City, Japan, October 1985.
48. "Global Trends in Motor Vehicle Air Pollution Control - The Significance for Developing Countries", Presented at Motor Vehicle Technology: Mobility For Prosperity, Jakarta, November, 1985, SAE # 852221.
49. "Worldwide Developments In Motor Vehicle Air Pollution Control: the Significance for Hong Kong and Other Rapidly Developing Urban Areas", Presented at Pollution in the Urban Environment, December 1985.
50. "The Benefits and Costs of Diesel Particulate Control IV - The In- Use Urban Bus", SAE # 860295, February 1986.
51. "Vehicle Emission Controls: The American Initiative and Its Worldwide Applications", the Eleventh North American Motor Vehicle Emissions Control Conference, April 1986.
52. "Motor Vehicle Emissions Control, Technology Transfer to Developing Countries", 79 th Annual Meeting of the Air Pollution Control Association, June 1986.
53. "The Commission Proposal for Control of Diesel Particulate: A Review", Prepared for the European Environment Bureau, July 1986.
54. "Heavy Duty Trucks and Buses: The U.S. Program and the Significance For The Federal Republic of Germany", A Report Prepared For The TUV Rheinland Institue Fur Energietechnik Und Umweltschutz, July 1986.

55. "Heavy Duty Trucks and Buses: The U.S. Program and the Significance For Sweden," A Report to the Swedish Environmental Protection Board, October 1986.
56. "Overview and Analysis of Emissions Related Inspection and Maintenance (I/M) Programs For In-Use Vehicles", A Report to the Swedish Environmental Protection Board, December 1986.
57. "Options For Reducing Particulate Emissions From Diesel Motor Vehicles In The Denver Metropolitan Area", A Report to the Denver Metropolitan Air Quality Commission, January 5, 1987
58. "Alternative Fuels - Prospects for the Year 2000", Presented to The American Public Transit Assoc. Advanced Diesel and Alternative Fuel Engine Workshop, March 19, 1987. (Oral Only)
59. "The Benefits and Costs of Diesel Particulate Control V Methanol Fuel for the In-Use Urban Bus," Society of Automotive Engineers Paper No. 870013, Warrendale, PA, 1987.
60. "The I/M Success Story: Where Do We Go from Here?," Society of Automotive Engineers Paper No. 870623, Warrendale, PA, 1987.
61. "Worldwide Developments in Motor Vehicle Pollution Control - A 1987 Overview," Society of Automotive Engineers Paper No. 871072, Warrendale, PA, 1987.
62. "Worldwide Developments in Motor Vehicle Pollution Control - The U.S. Experience and the Significance for the Asia Pacific Region," Presented at the 1987 Asia Pacific Conference on Pollution Control and Clean Air, Singapore, April 28-29, 1987.
63. Carhart, Bruce S. and Michael P. Walsh, "Potential Contributions to Ambient Concentrations of Air Toxics by Mobile Sources," Presented to the 80th Annual Meeting of APCA, New York, New York, June 24, 1987.
64. "Options for Reducing Particulate Emissions From Diesel Motor Vehicles In The Kuwait Metropolitan Area", A Report to the Kuwait Institute For Scientific Research, August 15, 1987.
65. "Energy and Environmental Issues Related To Transportation", A Report To The World Resources Institute, October 1987.
66. "Motor vehicle air pollution in Europe - a problem still not solved", Presented at the Institution of Mechanical Engineers Conference, London England, November, 1987.
67. "The Internationalization of Vehicle Emissions Control Regulation", Presented at the Fourth International Pacific Conference on Automotive Engineering, Melbourne, Australia, November, 1987.
68. "Global Trends in Motor Vehicles and Their Use Implications for Climate Modification." A Report Prepared for the World Resources Institute, Dec. 12, 1988.
69. "Global Trends in Motor Vehicle Pollution Control - A 1988 Perspective." SAE Technical Paper Series, 890581, Feb. 27-Mar. 3, 1989.
70. "Worldwide Developments in Motor Vehicle Diesel Particulate Control." SAE Technical Paper Series 890168 Feb. 27-Mar. 3, 1989.

71. "Motor Vehicle Pollution Control Present and Future Problems in Light of the U.S. Experience." Presented at the Royal Society, London, March 1989.
72. "The Global Importance of Motor Vehicles in the Climate Modification Problem." International Environment Reporter, May 89.
73. "Global Warming: The Implications for Alternative Fuels." SAE Technical Paper Series 891114, May 2-4, 1989.
74. "Worldwide Developments in Motor Vehicle Diesel Particulate Control." Proceedings of the 8th World Clean Air Congress, September, 1989.
75. "The Importance of Fuel Cells to Address The Global Warming Problem", The Grove Anniversary Fuel Cell Symposium, The Royal Institution, London, September 1989.
76. "Global Trends In Motor Vehicles And Their Use: Implications For The Local and Global Environment and Energy Consumption", Workshop On New Energy Technologies, Transportation and Development, Ottawa, Canada, September 1989.
77. "U.S. Auto Fuel Efficiency and Global Warming", MacKenzie and Walsh.
78. "Vehicle Pollution Control In Europe: The Local And Global Significance", presented at Highway Pollution, The Third International Symposium, Munich, West Germany, September 1989.
79. "The Importance of Fuel Cells to Address the Global Warming Problem." Journal of Power Sources Vol. 29 (1990): 13-28.
80. with Jan Karlsson "Motor Vehicle Pollution Control in Asia: The Lessons of Europe." SAE Technical Paper Series 900613, February 26 - March 2, 1990.
81. "California New Car Standards For Sweden: An Assessment." Prepared for The Swedish Environmental Protection Board, March 25, 1990.
82. "Motor Vehicle Pollution Control - A Global Challenge." A Report Prepared for the World Bank, Washington, D.C., May 1990.
83. "Motor Vehicle Pollution Control Into the 21st Century." A Report Prepared for the Norway State Pollution Control Authority, May 1990.
84. "Motor Vehicle Pollution In Hungary - A Strategy For Progress." A Report Prepared for The World Bank, June 1990.
85. "Risk Assessment/Risk Management of Motor Vehicle Emissions." A Report Prepared for Presentation at the 83rd Annual Meeting & Exhibition, Air & Waste Management Association Pittsburgh, Pennsylvania, June 1990.
86. Faiz, Asif, Kumares Sinha, Michael Walsh and Amiy Varma Automotive Air Pollution - Issues and Options for Developing Countries, Policy, Research, and External Affairs Working Papers, Infrastructure and Urban Development Department, The World Bank, Washington, D.C. August 1990.
87. "Motor Vehicle Pollution in Developing Countries, A Programme for Progress." Paper Prepared for European Transport and Planning 18th Summer Annual Meeting, Transport and

the Environment in Developing Countries, University of Sussex, England, 47-74, September 1990.

88. "Motor Vehicle Pollution Control in the US: An Overview." Paper Presented at the EFOA Fourth Conference, Brussels, Belgium, October 1990.

89. "The US Corporate Average Fuel Economy Program, Its Effects and Its Possible Application in Europe." Prepared for The Commission on Economic Instruments in Environmental Policy, Ministry of Environment and Energy, Stockholm, Sweden, 1990.

90. "Motor Vehicles and Global Warming." Chapter prepared for the Greenpeace Report, Global Warming, 1990.

91. "Driving Forces: Motor Vehicle Trends and their Implications for Global Warming, Energy Strategies, and Transportation Planning," MacKenzie and Walsh, World Resources Institute Report, December 1990.

92. "Motor Vehicles and Fuels: The Problem," Prepared for the EPA Journal, Volume 17, Number 1, January/February 1991.

93. "Motor Vehicle Pollution in Eastern Europe: A Case Study in Hungary," Dr. Pollack, Dr. Szoboszlai, and Dr. Meterei, M.P. Walsh, SAE Technical Paper Series, # 910107, International Congress and Exposition, Detroit, Michigan, February 25-March 1, 1991.

94. "Diesel |Particulate Control Around the World," Ron Bradow and Michael P. Walsh, SAE Technical Paper Series, # 910130, International Congress and Exposition, Detroit, Michigan February 25-March 1, 1991.

95. "The Clean Air Act Amendments: BNA's Comprehensive Analysis of The New Law," S. William Becker, Peter L. de la Cruz, Roger J. Marzulla, Thomas R. Munteer, Bradley Raffle, Stephen R. Seidel, Douglas Smith, James M. Strock, S. Craig Tautfest, John C. Topping, Jr. and Michael P. Walsh, Washington, DC, 1991.

96. "Motor Vehicles and the Environment - An Agenda for Rapidly Expanding Countries," Paper Prepared for Automotive Industry In Expanding Countries Conference Proceedings, SAE Technical Series, # 911726, September 1991.

97. "The Polluted Atmosphere - Environmental Challenges Posed by Growing Motor Vehicle Use," Paper prepared for Scania Centennial Jubileum, Transports and Environment, Sao Paulo, Brazil, September 19, 1991.

98. "Global Progress and Problems in Motor Vehicle Pollution Control," SAE Technical Paper Series, # 912422, International Fuels and Lubricants Meeting and Exposition, Toronto, Canada, October 7-10, 1991.

99. "Living Dangerously," Chapter Prepared for "Save the Earth" published by Turner Publishing, Inc., 1991.

100. "Risk Assessment/Risk Management Of Motor Vehicle Emissions", Published In Toxicology and Industrial Health, An International Journal, Proceedings of the IXth UOEH International Symposium and The First Pan Pacific Cooperative Symposium, Industrialization and Emerging Environmental Health Issues: Risk Assessment and Risk Management, Princeton Scientific Publishing Co., Inc, 1991.

101. "Motor Vehicle Regional and Global Trends: Implications for the Environment and Energy Consumption", Centre for Science and Technology for Development, Advanced

Technology Assessment System, Issue 6, Autumn 1991, Energy Systems, Environment and Development, A Reader.

102. "Urban Transport and the Environment in the Asia-Pacific Region", Proceedings of the IPC-6 Conference, Paper # 912596, October 28, 1991.

103. "Transport and the Urban Environment in Asia: Challenges and Opportunities", Polmet '91, Pollution in the Metropolitan and Urban Environment, December, 1991.

104. "Motor Vehicle Pollution: The Shrinking World and the Need For International Cooperation", Newsletter, International Association of Air Quality Officials, Issue Number 1.

105. "Control of Emissions From Vehicles in Use: OECD Environment Monographs No. 54", Michael P. Walsh, Organization For Economic Co-Operation and Development, Paris 1993.

106. "Motor Vehicle Pollution Control in Bangkok: A Strategy for Progress" - Prepared for The Thai Pollution Control Department, May 1994.

107. "Motor Vehicle Pollution Control in Bangkok: A Strategy for Progress, Phase 2" - Prepared for The Thai Pollution Control Department, May 1995.

108. "Vapor Emission from Gasoline Transport, Storage and Refueling in Bangkok - Motor Vehicle Pollution Control in Bangkok: the Need for and Benefits of Vapor Recovery Programs", submitted to National Energy Policy Office, September 1995.

109. "Air Pollution from Motor Vehicles: Standards and Technologies for Controlling Emissions", co authored with Asif Faiz and Christopher S. Weaver, The World Bank, Washington, D.C., 1996.

110. "Clean Fuels for Asia: Technical Options for Moving toward Unleaded Gasoline and Low-Sulphur Diesel", co-authored with Jitendra J. Shah, World Bank Technical Paper No. 377, The World Bank, Washington, D.C., September 1997.

111. "The Environment from the Standpoint of Motor Vehicle Design", contained in the Journal of International Association of Traffic and Safety Sciences: IATSS Research, Volume 21, No.2 1997.

112. "Global Trends in Diesel Emissions Control - A 1997 Update (Reprinted from: Diesel Exhaust Aftertreatment)", Michael P. Walsh, Society of Automotive Engineers, Warrendale, Pa., February 1997.

113. Contributed to "PM Abatement strategy for the Bangkok Metropolitan Area - Volume I - Report", Radian International LLC, Austin, Texas, February 1997.

114. "Global Trends in Diesel Emissions Control - A 1998 Update (Reprinted From: Diesel Exhaust Aftertreatment, 1998 (SP-1313), Society of Automotive Engineers, Warrendale, Pa. 1998

115. "Urban Traffic Pollution" Contributed Chapter: Motor Vehicle Emission Control Measures, World Health Organization, 1999.

116. "Urban Traffic Pollution" Co-authored Chapter: Case Studies from Cities Around the World, World Health Organization, 1999.

117. "Global Trends in Diesel Emissions Control - A 1999 Update (Reprinted From: Diesel

Exhaust Aftertreatment, 1999, Society of Automotive Engineers, Warrendale, Pa. 1999

118. "Sustainable Transport - The Challenge Ahead", in Studies in Environmental Science 72, Air Pollution in the 21st Century, Priority Issues and Policy, Edited by T. Schneider, Elsevier 1998.

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124. "Motor vehicle pollution and fuel consumption in China: the long term challenges", Energy for Sustainable Development, the Journal of the International Energy Initiative, Volume VII, No. 4, December 2003.

125. "Oil consumption and CO2 emissions in China's road transport, current status, future trends and policy implications", with He, Hao, Zhang, He, and Wang, Energy Policy, July 2004.

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127. "Controle Da Poluicao Dos Veiculos A Diesel – Uma Estrategia Para O Progresso No Brasil", editor along with Gabriel Murgel Branco

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