Comment 1 of 2

To: California Air Resources Board's Research Screening Committee (RSC)

Re: Research Proposal -- Impacts of Air Pollution on Life Expectancy across Multiple Generations: Race, Ethnicity, and Vulnerability Perspectives

Thank you for giving me the opportunity to provide comments on the above-mentioned research proposal. In addition to this brief memo, which provides comments specifically on your proposal, I have attached the following:

Attachment A: Brief paper -- Does Increasing PM2.5 Exposure Increase Death and Disease, and Reduce Life Expectancy?

Attachment B: Brief Bio for Commentator (Indur Goklany)

Attachment C: CV for Commentator

Attachment D: Partial List of Publications for Commentator

Unfortunately, this particular proposal is fatally flawed in that it assumes that exposure to PM2.5 is a major determinant of life expectancy (LE), and that there is an inverse relationship between life expectancy and PM2.5 concentrations. However, there are several natural experiments which suggest that both propositions may not be true. Accordingly, I would recommend against funding it.

Over the past 30-35 years, several countries in Asia have seen their average annual PM2.5 exposures first increase as fossil fuel use increased with industrialization, electrification and increased reliance on fossil fuels for transportation, and then decrease following the implementation of control measures. Each of these countries provides researchers with a natural experiment to test whether and to what extent PM2.5 exposure determines LE.

I have examined variations in annual population-weighted average exposure to PM2.5 in five Asian countries (India, Bangladesh, Pakistan, Nepal and China) from 1990 through 2017 and LE in these countries, as well as GDP per capita to capture socioeconomic progress over the same period. These data were obtained from the World Development Indicators Data Bank maintained by the World Bank.[1] Notably, the first four countries listed have the worst (i.e., highest) population-weighted PM2.5 annual exposure per the 2022 annual University of Chicago Air Quality Life Index (AQLI) report.[2]

As shown in Attachment A, regardless of the magnitude or direction of the trend in PM2.5 exposures in, LEs increased continually:

- Life expectancy has improved more or less continuously in each country, at least from 1990 onward regardless of whether PM2.5 exposures went up or down.
- Life expectancy apparently correlates far better with GDPpc than PM2.5 exposure.
- The ups and downs in PM2.5 exposures are not visible in the LE data.

[1] https://databank.worldbank.org/source/world-development-indicators#

[2] Greenstone M, Hasenkopf C, Lee K. Annual Update. Air Quality Life Index. 2022.

I then examined trends in age-adjusted rates in mortality and the burden of disease from 1990 to 2019 for each of the five countries using data from the Institute for Health Metrics and Evaluation's (IHME's) *2019 Global Burden of Disease* (GBD) study.[3] This examination confirmed that death and disease (and their rates) for each of the five countries seem substantially more sensitive to economic development than PM2.5 exposure. This also suggests that the cumulative direct and indirect effects of economic development (and fossil fuel use) on life expectancy not only outweigh the effects of PM2.5, they would also enable populations to reduce PM2.5 once more significant health threats are reduced.[4]

Attachments

Attachment A: Does Increasing PM2.5 Exposure Increase Death and Disease, and Reduce Life Expectancy?

Attachment B: Brief Bio for Commentator (Indur Goklany)

Attachment C: CV for Commentator

Attachment D: Partial List of Publications for Commentator

[3] IHME (2022). Global Burden of Disease 2019 (GBD) Results Tool. Institute for Health Metrics and Evaluation. Available at http://ghdx.healthdata.org/gbd-results-tool.

[4] Goklany IM. Have increases in population, affluence and technology worsened human and environmental well-being. *The Electronic Journal of Sustainable Development*. 2009;1(3):1

Attachment A

Does Increase in Population Exposure to PM2.5 Increase Death and Disease, and Reduce Life Expectancy?

Indur M. Goklany

Periodically we are flooded with reports of air pollution episodes in various developing countries, accompanied by claims of air pollution's staggering death toll and associated reductions in life spans. On June 22, 2022, CBS News[1] based on the 2022 update to an annual University of Chicago Air Quality Life Index (AQLI) report,[2] reported that air pollution was "slashing 10 years of life expectancy in Delhi, the world's most polluted city." It also noted:

> "About 44% of the global pollution [as characterized by PM2.5] since 2013 has come from India, according to the research by EPIC (Energy Policy Institute at the University of Chicago). The country has witnessed a huge spike in air pollution over the last few decades due to rapid industrialization and a heavy reliance on fossil fuels. The number of vehicles on the country's roads has increased about four-fold, the report notes. India is trying hard to switch to cleaner fuels, but experts have told CBS News that it's not going to be easy to quit the national coal habit.
>
> "The study ranked Bangladesh as the world's most polluted country overall, followed by India, Nepal, and Pakistan. People living in Bangladesh's capital Dhaka are losing nearly nine years of their lives to air pollution, while the national average stands at 6.9 years, according to the research."

The 2022 update then goes on to state that PM2.5 is the greatest risk for human health and far outweighs other risks including smoking, unsafe water and poor sanitation:

> "Measured in terms of life expectancy, the AQLI shows that ambient particulate pollution is consistently the world's greatest risk to human health. While particulate pollution is set to reduce global average life expectancy by 2.2 years,

[1] https://www.cbsnews.com/news/air-pollution-india-delhi-life-expectancy-down-10-years-most-polluted-city-epic-study/. Visited March 14, 2023.
[2] Greenstone M, Hasenkopf C, Lee K. Annual Update. Air Quality Life Index. 2022.

> first-hand cigarette smoke, for instance, reduces global life expectancy by about 1.9 years. Alcohol use reduces life expectancy by 8 months; unsafe water and sanitation, 7 months; HIV/AIDS, 4 months; malaria, 3 months; and conflict and terrorism, just 9 days."

In this paper I will examine whether life expectancies in the countries identified above (India, Bangladesh, Pakistan, Nepal and China, which for many in the world has been synonymous with air pollution since late 1990s) are inversely correlated with population exposure to annual PM2.5 over the post-1990 period. This will also help shed light on the claim that PM2.5 is the world's greatest health risk.

Note that the death toll estimated from air pollution is based on epidemiological/statistical models rather than on actual dead bodies.

High PM2.5 in each of these countries is due to high consumption of fossil fuels from industrialization, accompanied by the proliferation of fossil fuel driven transportation. Initially, these pollution sources had only rudimentary pollution controls, but the worsening air quality compelled authorities to impose control measures. Consequently, as we will see, in each of these countries the deterioration of air quality seems to have been halted and is now improving. Thus, each country provides us with a natural experiment which allows us to verify whether life expectancy, in fact, declines as population exposure to PM2.5 increases and then increases as PM2.5 decreases.

Trends in Population Exposure to PM2.5 and Life Expectancy

The five panels in the following figure show trends for the above identified Asian countries from 1990 through 2017 in (1) mean annual population exposure to ambient PM2.5, (2) life expectancy (LE), and (3) GDP per capita (GDPpc, a surrogate for both income and economic well-being which can have major effect on life expectancy). The figure starts in 1990 since population-weighted PM2.5 exposures are not available prior to that.

All data are taken from the World Development Indicators Data Bank. [3] For each country, it provides average population-weighted annual PM2.5 exposure based on Brauer et al. (2017).[4] LE and GDPpc data are also taken from the Word Development

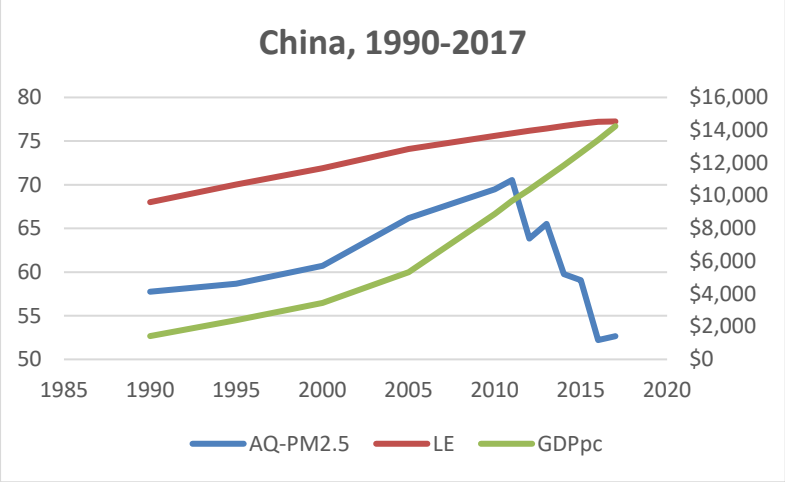
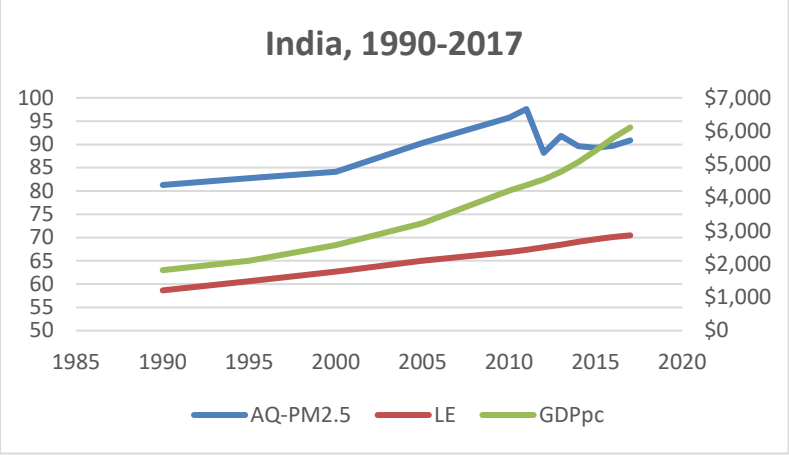
[3] Available at https://databank.worldbank.org/source/world-development-indicators. Visited March 15, 2023. GDP per capita (GDPpc) is estimated in constant 2017 international dollars based on purchasing power parity (PPP).
[4] Brauer, M. et al. (2017), for the Global Burden of Disease Study 2017.

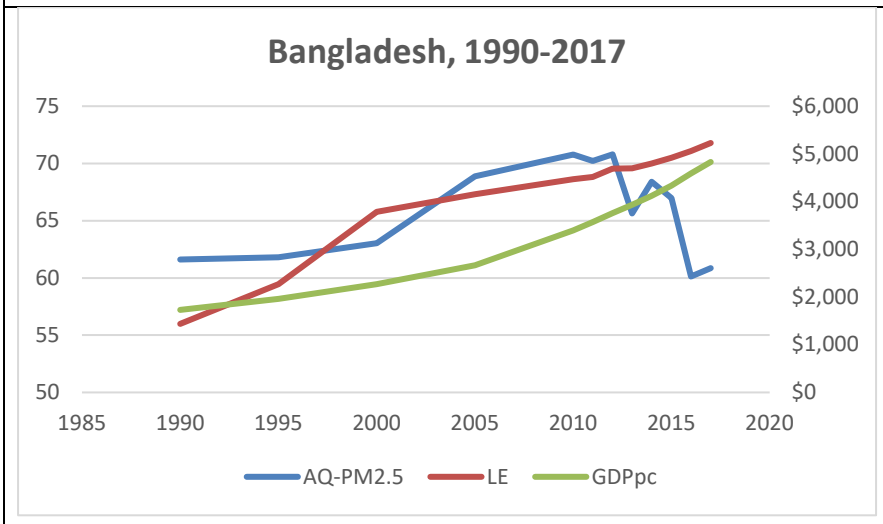
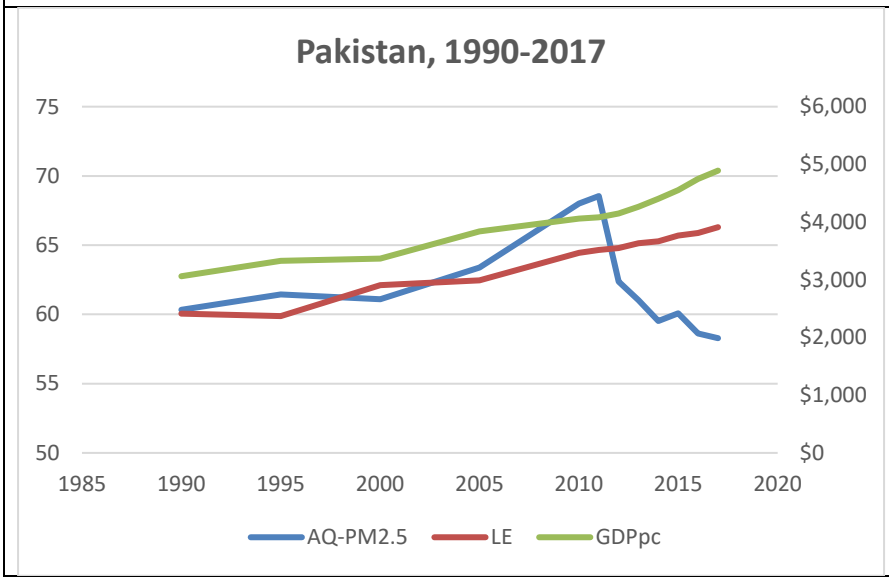
Bank's online databank. Note that for each country PM2.5 increases and then decreases during the 1990-2017 period.

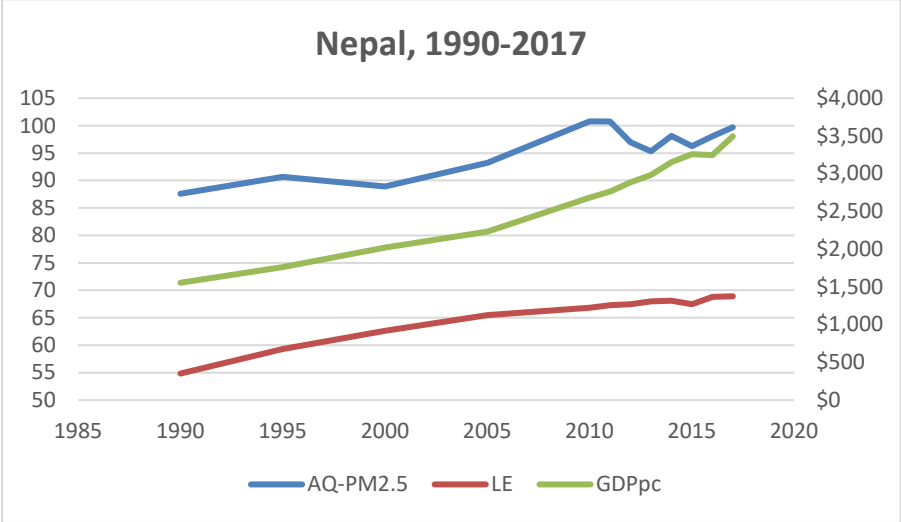
Each panel shows that:

- Life expectancy has improved more or less continuously in each country, at least from 1990 onward regardless of whether PM2.5 exposures went up or down.
- Life expectancy correlates far better with GDPpc than PM2.5 exposure.
- The ups and downs in PM2.5 exposures are not visible in the LE data.

Thus, it's not evident that PM2.5 shortens lifespans. But if it does, its effects are more than overwhelmed by increases in life expectancy enabled directly or indirectly by economic growth (which is enabled by fossil fuel consumption) and associated technological advances and improved access to public health measures and medical care (that is, economic growth and technological change).

	1. Despite an increase of 16.2% in PM2.5 exposure from 2000 through 2011, LE increased 5.6%. 2. GDPpc increased 180% over the same period. 3. The variations in PM2.5 exposure are not evident in the LE data.
	1. Despite an increase of 16.2% in PM2.5 exposure from 2000 through 2011, LE increased 7.5%. 2. GDPpc increased 70.1% over the same period. 3. The variations in PM2.5 exposure are

	not evident in the LE data.
	1. Despite an increase of 12.3% in PM2.5 exposure from 2000 through 2012, LE increased 5.7%. 2. GDPpc increased 65.7% over the same period. 3. The variations in PM2.5 exposure are not evident in the LE data.
	1. Despite an increase of 12.2% in PM2.5 exposure from 2000 through 2011, LE increased 4.1 %. 2. GDPpc increased 21.2% over the same period. 3. The variations in PM2.5 exposure are not evident in the LE data.



1. Despite an increase of 13.3% in PM2.5 exposure from 2000 through 2011, LE increased 7.5 %.
2. GDPpc increased 36.8% over the same period.
3. The variations in PM2.5 exposure are not evident in the LE data.

Individually and collectively the above figures are inconsistent with the claim that exposure to PM2.5 is the greatest health risk in the world. The estimated relationship between such exposure and mortality is unreliable and should not be used to develop public policies.

So why the discrepancy between claims that PM2.5 (or air pollution more generally) reduces life expectancy and the reality that life expectancy has actually increased and continues to increase in some of the most polluted countries of the world whether population exposure to PM2.5 increases or not?

A couple of reasons, which are not mutually exclusive, come to mind:

- The cumulative direct and indirect effects of economic development (and fossil fuel use) on life expectancy not only outweigh the effects of PM2.5, they also enable populations to reduce PM2.5 once more significant health threats are reduced.[5]

- Life expectancy is based on data on real births and real deaths, whereas the mortality effects of PM2.5 are based on "statistical" deaths or, to use a term

[5] Goklany IM. Have increases in population, affluence and technology worsened human and environmental well-being. *The Electronic Journal of Sustainable Development*. 2009;1(3):1

currently in vogue, "fake" deaths.[6] As Steve Milloy is fond of asking, "Where are the bodies?"[7]

In today's world, one could argue that claims of air pollution shortening life expectancy are fake news premised on fake deaths.

Trends in Death Rate and the Burdens of Disease

It is sometimes argued that looking at absolute number of deaths may be misleading because we may be trading off reductions in deaths for increases in disease and disability. On the other hand, declines in the absolute number of deaths without accounting for changes in population and its age structure of the population may mask the full extent of the improvement in the population's health condition over time.

To address these two concerns, the following two figures, based on estimates by the Institute for Health Metrics and Evaluation's (IHME's) *2019 Global Burden of Disease* (GBD) study,[8] display trends in the age-adjusted rates of death and the burden of disease from 1990 through 2019 for each of the five countries examined above.[9] Note that these figures are consistent with the panel results shown previously.

The burden of disease is calculated using *disability-adjusted life year (DALY)*. It includes the potential years of life lost (YLL) due to premature death from a disease (or condition) as well as the years spent living with that disease or condition weighted by the severity of the disease [YLD]. Thus, DALY = YLL + YLD.

[6] Estimates of deaths from air pollutants are based on epidemiological studies. However, these studies have several shortcomings. They include the fact that it is inappropriate to use outdoor monitors fixed in space to represent population exposure to PM2.5 (because most people move around, spend a substantial period of time indoors, and indoor and outdoor air quality may not always be the same for a variety of reasons). Steve Milloy has an extensive critique of a recent epidemiological air pollution study that illustrates many of these shortcomings.
[7] Milloy S. Claim: PM2.5 killed 1.22 million Chinese in 2013 — So where are the bodies?
[8] IHME (2022). Global Burden of Disease 2019 (GBD) Results Tool. Institute for Health Metrics and Evaluation. Available at http://ghdx.healthdata.org/gbd-results-tool.
[9] IHME Global Burden of Disease 2019 (GBD) Results Tool. Available at Global Burden of Disease 2019 (GBD) Results Tool. Available at http://ghdx.healthdata.org/gbd-results-tool, downloaded March 18, 2023.

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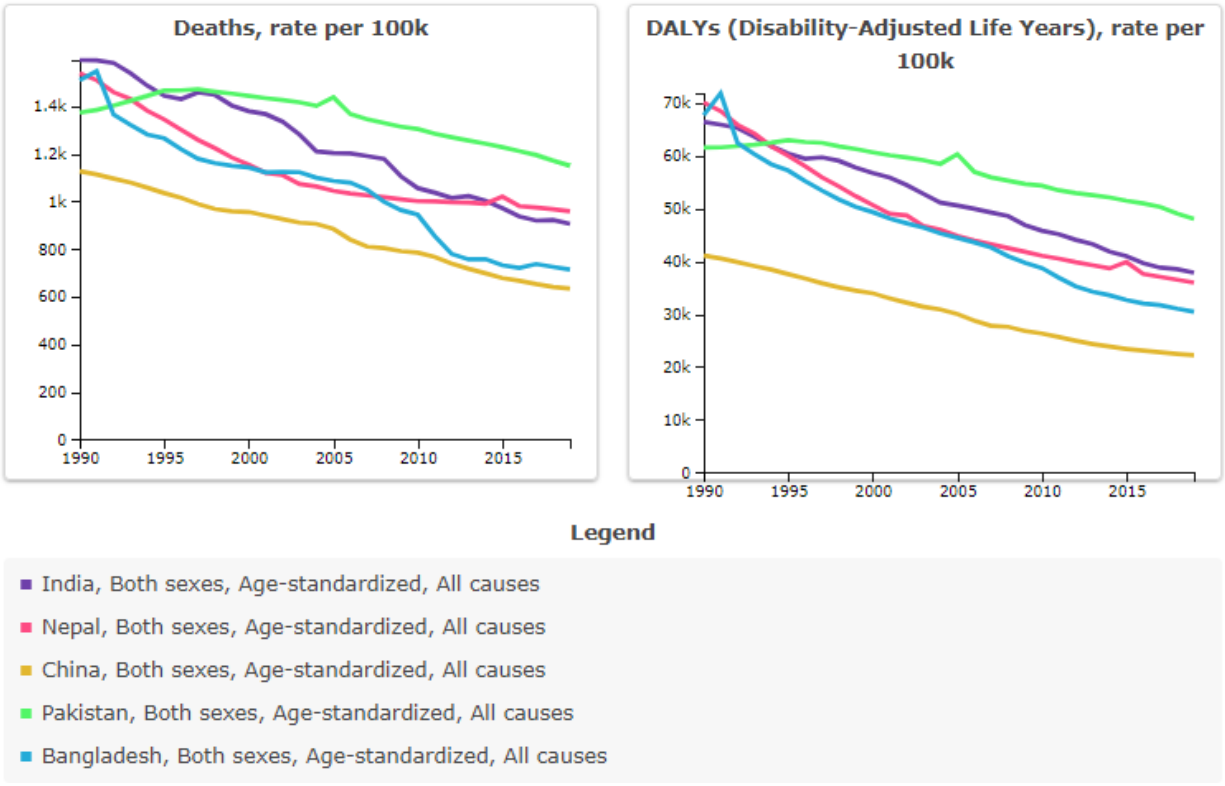

The figures on rates of death and burden of disease show that both rates have improved more or less continuously in each country at least from 1990 onward regardless of whether PM2.5 exposures went up or down. Comparing these two figures with the previous panels, the decline in these rates seem to correlate far better with GDPpc than PM2.5 exposure. Notably, the wiggles in PM2.5 exposures (shown in the previous panels) are not visible in the death and disease rates for the most part except, possibly, for the slight bumps for Pakistan in 2005, Bangladesh in 1991 and Nepal in 2015. Each of these bumps are associated with major natural disasters. The 2005 Pakistan bump can be ascribed to the (moment) magnitude 7.6 earthquake (followed by nearly 1,000 aftershocks in excess of 4.0) near Muzaffarabad which killed an estimated 86,000-87,400, which is slightly more than 6% of total deaths in Pakistan in 2004 or 2006.

Similarly, the 1991 spike for Bangladesh was due to a cyclone that claimed 139,000 lives, and the 2015 spike for Nepal was due to a 7.8 (moment) magnitude earthquake.

To summarize:

- Death and disease (and their rates) for each of the five most polluted countries (as identified by exposure to PM2.5) seem substantially more sensitive to economic development than PM2.5 exposure.
- The cumulative direct and indirect effects of economic development (and fossil fuel use) on life expectancy not only outweigh the effects of PM2.5, they would also enable populations to reduce PM2.5 once more significant health threats are reduced.[10]

Finally, the foregoing suggests that any analysis of the impacts of PM2.5 based on currently available dose-response functions between PM2.5 and human mortality and morbidity (which indicate high sensitivity to PM2.5) may result in misleading conclusions.

[10] Goklany IM. Have increases in population, affluence and technology worsened human and environmental well-being. *The Electronic Journal of Sustainable Development*. 2009;1(3):1

Attachment B: Brief Bio for Commentator (Indur Goklany)

Ph. D., M.S., and Bachelor's degrees in Electrical Engineering from the Michigan State University and the Indian Institute of Technology, Bombay.

- Worked with federal and state agencies, think tanks, and the private sector for over 45 years, including 35 years working on climate change issues.
- Member of the Federal Senior Executive Service from 1992 to retirement (2021).
- Written extensively on the interactions between globalization, economic development, environmental quality, technological change, climate change, and human well-being. Writings include about a 150 papers, books and monographs (see Google scholar page here.)
- Books include *The Improving State of the World, The Precautionary Principle*, and *Clearing the Air: The Real Story of the War on Air Pollution,* all published by the Cato Institute.
- Involved with the Intergovernmental Panel on Climate Change since before its inception — as an author, U.S. delegate and Expert Reviewer. Part of the U.S. team that negotiated the UN Framework Convention on Climate Change, and later a delegate to that organization.
- Developed the emissions trading program in the Environmental Protection Agency before emissions trading became the vogue. Received EPA's bronze medal for developing the first-ever emission trading scheme (which involved sources subject to new source performance standards).
- Received the Julian Simon Prize and Award by the Competitive Enterprise Institute in 2007.
- Many of Dr. Goklany's publications can be viewed on Google Scholar, ResearchGate and SSRN

Attachment C: CV for Commentator (Indur Goklany)

INDUR M. GOKLANY

Résumé

WORK EXPERIENCE:

Senior Executive Service (12/92-retirement in 7/2021), Office of Policy Analysis, Department of the Interior, 1849 C Street, NW, Washington, DC 20240. Served in various, sometimes overlapping capacities: **Senior Advisor** (11/2011-7/2021)**; Assistant Director, Programs & Science & Technology Policy** (12/2008-11/2011)**; Assistant Director, Science & Technology Policy** (6/02-11/11); **Manager, Science and Engineering** (3/94-6/02); **Deputy Director** (1/93-5/93); and **Assistant Director, Program Analysis Staff** (9/92-3/94)**.**

Duties

- Manage groups of policy and program analysts working on issues that require integration of science and policy related to conservation, development, use and management of natural resources and the environment, i.e., land, water, mineral and energy resources. In all capacities I have had to provide leadership to and manage multidisciplinary groups composed of individuals from other offices, organizations and departments, and, in some cases, other countries in order to deliver quality products in a timely fashion.
- Help reconcile differing and often competing views and perspectives on a wide variety of matters and issues held by various bureaus within Interior, different governmental agencies and different countries (as applicable).
- Provide independent policy analysis and develop consensus on policies. Issues dealt with include climate and global change, natural resource use, air and water pollution, hazardous wastes, energy policy, population, biological diversity, biotechnology, and environmental impacts of agriculture.

Accomplishments (examples)

- Served as a U.S. delegate to the UN Framework Convention on Climate Change (2007).
- As a U.S. delegate to the Intergovernmental Panel on Climate Change (IPCC) Work Group II (2003-08), which dealt with climate change impacts, vulnerability and adaptation helped develop the work plan for the IPCC's First, Second and Fourth Assessment Reports. As an expert reviewer, reviewed various drafts of over a dozen chapters of the IPCC's Fourth and Fifth Assessment Reports including the chapters dealing with Impacts, Adaptation and Vulnerability regarding food, fiber and forests; fresh water resources; ecosystems; human

health, sustainability; adaptive practices; key vulnerabilities and risks; sustainable development; and the relationship between mitigation and adaptation.

- Developed several papers on the impacts of, and adaptation to, climate change for consumption within DOI and the U.S. government, as well as for peer reviewed publications with specific reference to ecosystem health, public health, food and hunger, extreme events, and water resources (see attached publication list). Similarly, developed papers and publications exploring the relationship between adaptation, mitigation and sustainable development. One result was that I was the sole U.S. delegate to a U.K. government initiated conference on avoiding dangerous climate change (2005).
- As the lead policy analyst on climate change in the Office of the Secretary, Department of the interior, provided detailed comments on the Fourth National Climate Assessment (including the Climate Science Special Report) on a wide range of issues (e.g., scenario development, model accuracy, impacts of climate change on extreme weather events, wildfire, health, water resources) (2017-2018).
- Served on a OMB Office of Information and Regulatory Affairs-led interdepartmental team reporting to a sub-cabinet (Deputy Secretary) level policy group that helped develop a variety of clean air rules, including the Clean Skies Initiative and the Clean Air Interstate Rule to reduce sulfur dioxide and nitrogen oxide emissions, and ozone and particulate matter ambient air quality standards (2003-2008).

Independent Scholar (1996-2011). Research and write on environmental issues ranging from climate change, biodiversity, land use, biotechnology, agriculture, precautionary principle, air and water pollution, and the role of economic growth and technological change on environmental and human well-being.

Visiting Fellow, American Enterprise Institute (11/2002-1/03)**.** Undertake research on the relationship between economic growth and technological change to human well-being and environmental quality.

D&D Foundation Julian Simon Fellow, Political Economy Research Center (6/00-9/00). Undertake research on the relationship between economic growth and technological change to human well-being and environmental quality.

Senior Program Analyst, **Office of Policy Analysis, U.S. Department of the Interior** (12/85-9/92).

Duties

Served as the Department's expert on national and international environmental issues, e.g., climate and global environmental change, sustainable development, biological diversity, acid rain, and air quality. Integrated related science and policy issues. Represented the Department on several interdepartmental and international task forces, work groups and committees dealing with scientific, impact and policy issues related to the above environmental matters.

Accomplishments (examples):

- As <u>Executive Director, Departmental Working Group on Climate Change</u> (1989-92),

conceived, organized, coordinated and managed the development of a new seven bureau, multidisciplinary departmental initiative as part of the fledgling Federal Global Change Research Program. Result: Appropriations for DOI (mainly USGS) GCRP increased from $5.3 million in FY 1989 to $39.4 million in FY 1992 for this Departmental initiative.

- As Leader of the U.S. delegation to, and *rapporteur* (i.e., Executive Secretary) of the Intergovernmental Panel on Climate Change's (IPCC) Resource Use and Management Subgroup (1988-90), planned, organized, coordinated and executed the Subgroup's 18-month work plan to produce its First Report. This international effort required constantly dealing with other U.S. agencies, as well as foreign government entities. This report, which met its schedule and objectives, which I was responsible for ensuring, addressed land use, water resources and unmanaged ecosystems. Also, as U.S. delegate to the IPCC and its Work Group II, participated in, and contributed to, the work of the subgroups dealing with sea level rise and agriculture and forestry. The First Assessment Report served as a basis for the United Nations General Assembly sponsored Framework Convention on Climate Change (FCCC) on greenhouse gases and addressed policy options to adapt to possible climate change. Also, coordinated and managed U.S. Government input to this exercise as Chairman, U.S. Interagency Task Force on Resource Use and Management. Helped develop the notion that adaptation is a viable response to dealing with climate change.
- Served as the DOI representative to the Interagency Policy Committee for the $80 million-per-year interagency National Acid Precipitation Assessment Program (1986-93).
- U.S. delegate to the Intergovernmental Panel on Climate Change (IPCC) and the Technical Committee to the Intergovernmental Negotiating Committee for the United Nations Framework Convention on Climate Change (UNFCCC) (1988-93). Helped develop the work plan of the IPCC's First and Second Assessment Reports (1988-93).
- Helped develop the terms of reference for the IPCC in advance of its founding. Introduced the concept, which was ultimately adopted, that it should assess not only the science of climate change but also its social, economic and environmental impacts (as well as those of its policies) (1988).
- Served as the DOI representative to various task forces that developed technical and policy options related to, for instance, sulfur dioxide and nitrogen oxide protocols for the Economic Commission for Europe's Convention on Long Range Transboundary Air Pollution, the US/Canada Air Quality Agreement, UNCED, Montreal Protocol, and various G-7 summits (1986-93).
- Provided detailed input to the World Commission on Sustainable Development (AKA, the Brundtland Commission"), established by the United Nations General Assembly (1986-87), much of which was incorporated in the Commission's final report. This report developed the concept of "sustainable development" and helped make it part of the policy dialogue worldwide.

Regulatory Reform Staff, Office of Policy, Planning and Evaluation, EPA (1984-85). Progressed

from **Expert Consultant** to **Staff Scientist** (GS-14) to **Acting Chief** (GM-15), Air and Hazardous Waste Section. Responsible for regulatory reform initiatives for air and hazardous waste control including the emissions trading policy statement. Helped develop EPA's first new source emission trade (bubble), for which was awarded an EPA bronze medal. Responsible for helping EPA adopt the emissions trading policy statement in the mid-1980s. These efforts laid the foundation for cap-and-trade programs that are now generally recognized as the most effective method of controlling air pollution while also meeting ambient standards.

Senior Policy Consultant, TRC Environmental Consultants (1982-84) and **Environmental Research and Technology** (1980-82). Responsible for technical and policy analyses on environmental and energy issues, develop business and market skills in these areas. Manage multidisciplinary programs. Topics studied included acid rain, visibility, regulation of energy sources. Clients included American Petroleum Institute, Edison Electric Institute, Utility Air Regulatory Group, General Electric, Environmental Protection Agency and the Government of Saudi Arabia.

Chief, Technical Assessment Division, National Commission on Air Quality, Washington, D.C. (1979-80). Responsible for technical and policy analysis for a Congressional Commission charged with evaluating the effectiveness of the Clean Air Act and its impact on public health, the environment, energy and industrial growth, and making recommendations on possible changes to the Act.

Group Leader and **Environmental Engineer, Technical Analysis Section, Region V, EPA**, Chicago, IL (1977-79). Responsible for providing to the six Midwest states (which comprised the industrial heartland of the United States) technical and regulatory guidance on particulate matter and sulfur dioxide State Implementation Plans including the development of control strategies, atmospheric dispersion modeling and regulations. Established EPA's permitting group for that region.

Air Quality Engineer, Michigan Air Quality Division, Lansing, MI (1974-77). Helped develop the State Implementation Plan (SIP) for ozone for the State of Michigan. Responsible for permitting of air pollution sources ranging from steel mills, taconite and salt mines, automobile manufacturing plants, power plants, foundries, and sundry manufacturing sources.

Postdoctoral Research Associate, Biophysics Department (1973) and **Assistant Instructor, Physics Department** (1974), Michigan State University, E. Lansing, MI.

SCIENTIFIC & TECHNICAL CREDENTIALS:

Ph.D. (1973) and **M.S.** (1969), **Electrical Engineering and Systems Science**, Michigan State University, East Lansing, MI. Thesis/ Research Assistantship with the Biophysics Department.

B. Tech. (Honors) in **Electrical Engineering**, Indian Institute of Technology, Bombay, India (1968).

Publications: 3 books, 29 monographs, 75 papers, plus dozens of correspondence and presentations in conferences. Topics include resource scarcity (including land, minerals and

water), climate change, environmental and health risk analysis, public health, air pollution from energy sources, and the relationship between economic development and technological change to sustainable development and economic and environmental well-being. See attached list.

Founder and co-editor (2006-2010): *Electronic Journal of Sustainable Development*

PERSONAL: U.S. Citizen.

SAMPLE OF AWARDS:

2007 - Julian Simon Prize

1992 - Performance Award (DOI)

1992 - Meritorious Service Award (DOI)

1991 - Performance Award (DOI)

1990 - Performance Award (DOI)

1989 - Quality Increase Award (DOI)

1988 - Quality Increase Award (DOI)

1988 - Secretary's Commendation (DOI)

1987 - Quality Increase Award (DOI)

1986 - Special Achievement Award (DOI)

1985 - Special Achievement Award (EPA)

1984 - Bronze Medal (EPA)

Attachment D

INDUR M. GOKLANY

Partial List of Publications
(Books, Monographs, Book Chapters, Papers and Other Publications)
[Note: Co-authored publications are indicated by an *]

BOOKS

The Improving State of the World: Why we're living longer, healthier, more comfortable lives on a cleaner planet (Cato Institute, Washington, DC, 2007).

The Precautionary Principle: A Critical Appraisal of Environmental Risk Assessment (Cato Institute, Washington, DC, 2001, October).

Clearing the Air: The Real Story of the War on Air Pollution (Cato Institute, Washington, DC, 1999).

MONOGRAPHS

Impacts of Climate Change: Perception and Reality. Global Warming Policy Foundation, London. Report 49. ISBN 978-1-8380747-3-9 (2021).

The Lancet Countdown on Climate Change: The Need for Context. Global Warming Policy Foundation, London. Report 41. ISBN 978-1-9160700-8-0 (2020).

Carbon Dioxide: The Good News. Foreword by Freeman Dyson. Global Warming Policy Foundation, London (2015).

Global Warming Policies Might Be Bad for Your Health. Global Warming Policy Foundation, London. ISBN 978-0-9566875-7-9. (2012).

Misled on Climate Change: How the UN IPCC (and others) Exaggerate the Impact of Global Warming, Reason Foundation, Policy Study No. 399, December 2011.

Wealth and Safety: The Amazing Decline in Deaths from Extreme Weather in an Era of Global Warming, 1900–2010, Reason Foundation, Policy Study No. 393, September 2011.

Living with Global Warming. Policy Report No. 278 (Dallas, TX, National Center for Policy Analysis, September 2005).

Is Climate Change the 21st Century's Most Urgent Environmental Problem? Lindenwood University, Economic Policy Lecture 7 (St. Charles, MO, Lindenwood University, 2005).

**Carbon Sequestration,* Final Draft, Department of the Interior, September 2002.

Economic Growth and the State of Humanity. Political Economy Research Center, Policy Study 21. March 2001.

Applying the Precautionary Principle to Global Warming. Center for the Study of American

Business, Washington University, St. Louis, MO. Policy Study 158. November 2000.

Applying the Precautionary Principle to Genetically Modified Crops. Center for the Study of American Business, Washington University, St. Louis, MO. Policy Study 157. August 2000.

Do We Need the Federal Government to Protect Air Quality?, Policy Study 150, Center for the Study of American Business, Washington University, St. Louis, MO, December 1998.

Air and Inland Surface Water Quality: Long Term Trends and Relationship to Affluence, Office of Program Analysis, U.S. Department of the Interior, Washington, DC, 1994.

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SAMPLE OF ADDITIONAL STUDIES MANAGED BY DR. GOKLANY

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Economic, Environmental, and Coal Market Impacts of SO_2 Emissions Trading Under Alternative Acid Rain Control Proposals. Done by ICF, 1989.

Modeling the Impacts of Policy Change: A Discussion of Alternative Approaches. Done by Paul Portney and Ray Kopp, Resources for the Future, 1989.

A Study of the 1979 SIP Submittals. Done by PES for NCAQ, August 1980.

A Study of PSD and Offset Permits. Done by Dames & Moore for NCAQ, September 1980.

*Management and Technical Procedures for Operation and Maintenance of Air Pollution Control Equipmen*t. By PEDCO for EPA Region V, June 1979.

Design Considerations for Minimizing Operation and Maintenance Problems of Particulate Control Equipment. By PEDCO for EPA Region V, May 1980.

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S. Stanley Young, Comments for the CARB RSC, Apr 26, 2023

I am an applied statistician, Fellow of the American Statistical Association and American Association for the Advancement of Science, with many years of experience looking at complex data problems including environmental epidemiology. See short bio**.

The current CARB paradigm is that air pollution "causes" all-cause mortality. The causal assertion started with Dockery et al. 1993, who claimed a risk ratio of 1.26. A person had 26% greater than chance of dying from poor air quality than a person with low exposure. A risk ratio of 1.26 looks very impressive, but the sample size was small, ~8,000. In another EPA funded study at about the same time, Styer et al. 1995 found no effect of air quality on mortality. The two studies were in direct conflict. Later Roger Peng of JHU commented that it was a testament to the utility and power of statistical analysis that an effect as small as 1.05 could be reliably detected. Note that we have moved from 1.26 to 1.05. In 2020, WHO put the risk ratio at a trivial 1.0065, Orellano et al. 2020. In 2017, Young et al. reported on the analysis of a massive California data set: 13 years of data; eight highly populated air basins; 37,000 days of exposure. They found no effect. Their sensitivity analysis included over 78,000 analyses. That data and code is public, and the claim is not disputed. Until CARB deals with the data and analysis of Young et al. 2017 (the data is public, and the analysis code is public) we need to assume that there is no effect of PM2.5 on acute mortality in California. If there is no effect on acute mortality, it is difficult to imagine an effect on longevity.

Association studies are subservient to experimental studies. If active intervention leads to a response, then that is vote for causality. Chay et al. 2003 analyzed a quasi-experiment. The EPA forced some 250 counties to improve air quality; there were approximately 250 control counties where the EPA did not intervene. Air quality improved and there was no improvement in deaths. The data set was obtained and reanalyzed by Obenchain and Young 2017. They confirmed that there was no effect of air quality on mortality. Zhu et al. 2016 noted that forest fires in Quebec increased PM in Boston and NYC. Deaths did not increase. The EPA funded Greven et al. 2011 study found no effect of poor air quality on all-cause deaths within locations. NB: within locations, many covariable are similar, i.e. controlled.

Su (and CARB) should study Young et al. 2017, then confirm or deny those results by getting, posting, and analyzing California daily death data for the years 2013-2020. If the no effect claims of Young et al. 2017 are wrong, they should show up in California death data for the years 2013-2020. Obtaining and posting this data is a direct and less expensive than the Su CARB contract.

Zhang should note Young found no death effect in San Joaquin Valley for the years 2000-2012. Are we flogging a dead horse? Are we sending good money after bad (there is no demonstrated association of PM with mortality in the San Joaquin Valley? See Young et al. 2017.)? Zhang should note that data presented by EPA researchers, Pye et al. 2021, indicates that biogenic VOCs, compounds from trees and grasses, appeared more associated with mortality than

anthropomorphic compounds, Obenchain and Young, 2022. See also Fogel et al. 2013 for matrix factorization.

It is natural and expected for researchers to present their work in the best possible light. It is natural for regulatory agencies to attempt to expand their remit. One function of the Research Screening Committee is to counterbalance these tendencies.

My son-in-law says, every pancake has two sides, no matter how thin. Does PM2.5 cause increased deaths? Appeal-to-authority, Bonnie Holmes-Gen, is no answer to Young et al. 2017 or Enstrom, 2005. 2017.; data and analysis are the ways forward. Virtually all the positive PM/health effect studies are association studies and, everyone agrees, correlation is not causation. It takes only one valid negative study to sweep all the association studies off the table.

Get the daily death data for California for the years 2013-2020, following Young et al. 2017, and make the data public.

See also the Shifting Sands report of Young, Kindzierski and Randall, 2021.

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**Short Bio

Dr. S. Stanley Young is currently the CEO of CGStat and previously worked at Eli Lilly, GlaxoSmithKline and the National Institute of Statistical Sciences on questions of applied statistics. His current interest is studying methods used in the evaluation of observational studies. He also works on bioinformatics problems.

Dr. Young graduated from North Carolina State University, BS, MES and a PhD in Statistics and Genetics. He worked in the pharmaceutical industry on all phases of pre-clinical research. He has authored or co-authored over 70 papers including six “best paper” awards, and a highly cited book, *Resampling-Based Multiple Testing*. He has three issued patents. He is interested in all aspects of applied statistics. He conducts research in data mining.

Dr. Young is a Fellow of the American Statistical Association and the American Association for the Advancement of Science. He is an adjunct professor of statistics at North Carolina State University, the University of Waterloo, and the University of British Columbia where he has co-directed thesis work. He is also an adjunct professor of biostatistics in the Jiann-Ping Hsu College of Public Health at Georgia Southern University. Dr. Young served on the Scientific Advisory Board of the U.S. Environmental Protection Agency, 2017-2021.