

Envisioning the Future

*Planning for the HEI Strategic Plan 2020 – 2025
and Beyond...*

**HEI Annual Conference
Seattle, Washington
May 7, 2019**



Trusted Science • Cleaner Air • Better Health

Our Agenda Today

- *Choosing the Future*
 - *Planning Ahead: **The HEI Strategic Plan 2020 – 2025***
 - *HEI's Impact on Science and Policy*
 - *Challenges and Opportunities:*
 - Testing the Links Between AQ Action and Health : Accountability
 - Complex Questions for the Air Pollution Mixture
 - Transport and Urban Health
 - Global Health
 - *A Major Crosscutting Issue: Transparency in Policy Relevant Science*
 - *Other Cross Cutting Issues to be Integrated into All HEI Science*
 - *Next Steps Toward Choosing the Future*

HEI's Strategic Plan

Targeting HEI's research and review activities;

Responding to the needs of HEI industry & government sponsors, and other interested parties;

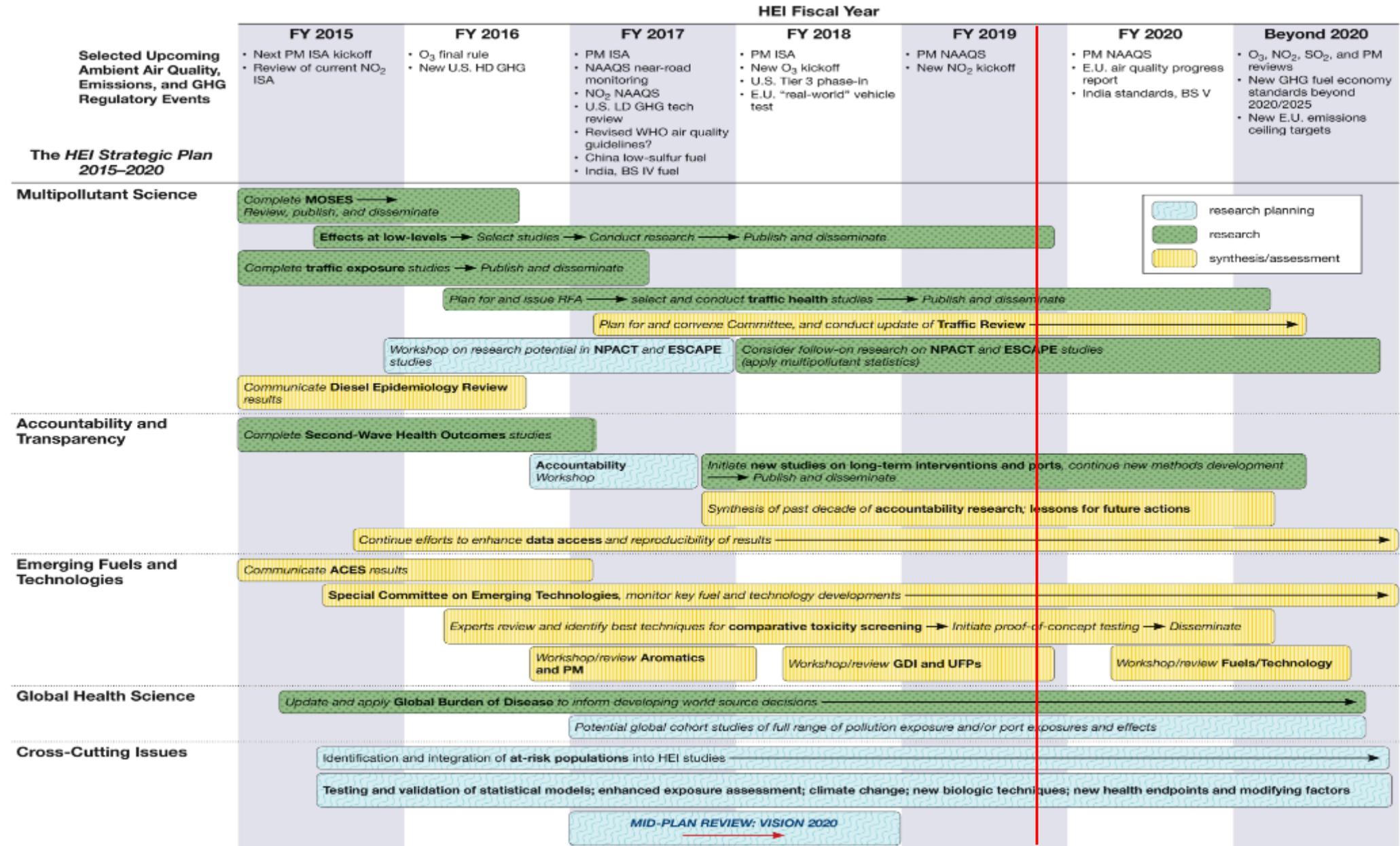
Anticipating future policy and technology events; and,

Evolving over time to adapt to changing knowledge and events

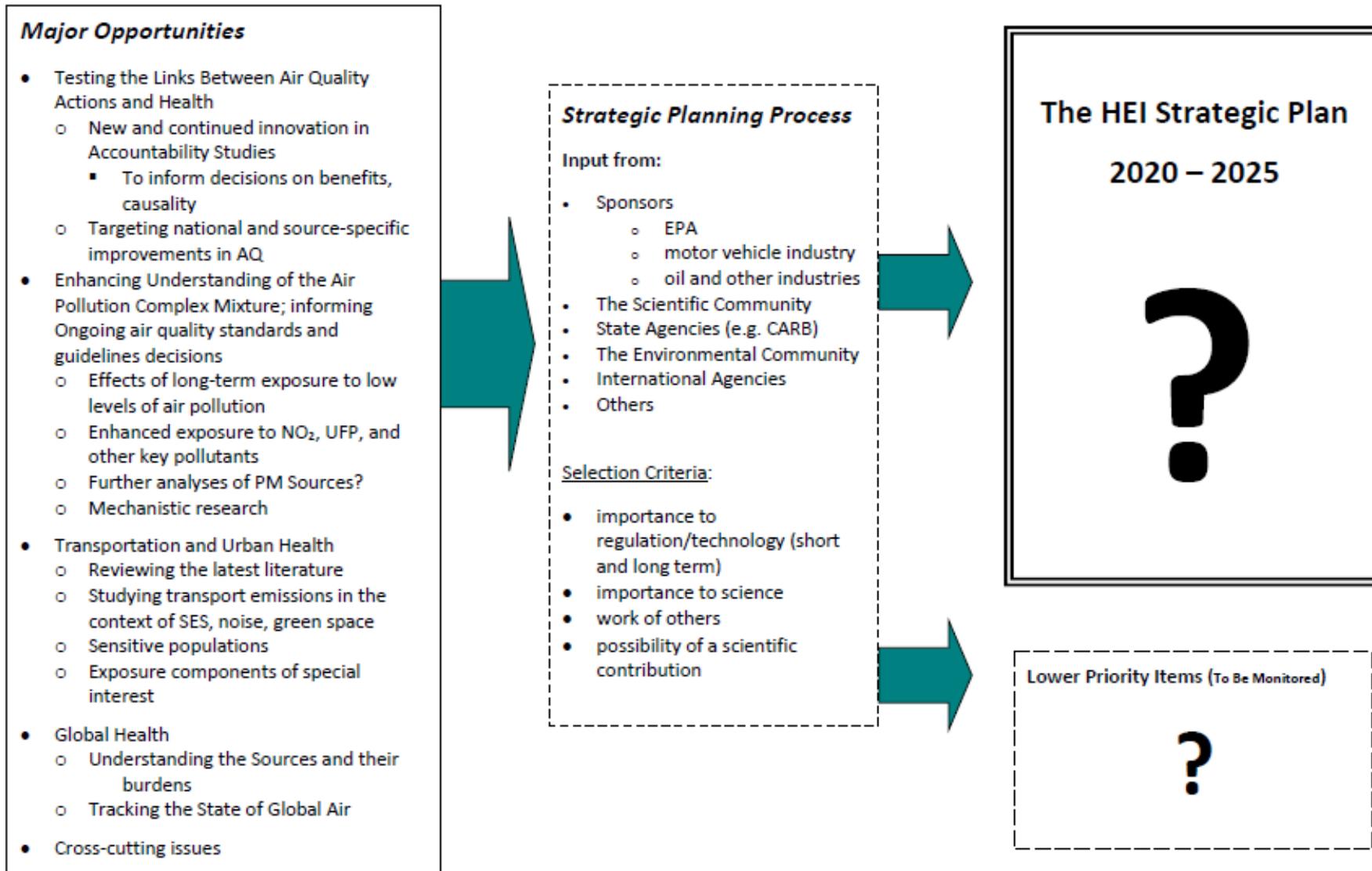
Thank you for your ongoing feedback as we develop and implement the Plan



Implementation of the Strategic Plan 2015 – 2020



Choosing the Future



Building a New Strategic Plan

Next plan effective 2020 – 2025

A Strong Commitment to Gaining Input on key factors

-Upcoming regulatory drivers (e.g. NAAQS, traffic, climate and air pollution), key science questions (e.g. threshold, multi-pollutant), new ideas and issues (e.g., new fuels)

Winter 2018-19 Visits to individual sponsors, stakeholders, science community

March 2019 Sponsor meeting with Research Committee to hear recommendations

April 2019 First Draft Plan, many options, circulated to sponsors for comment

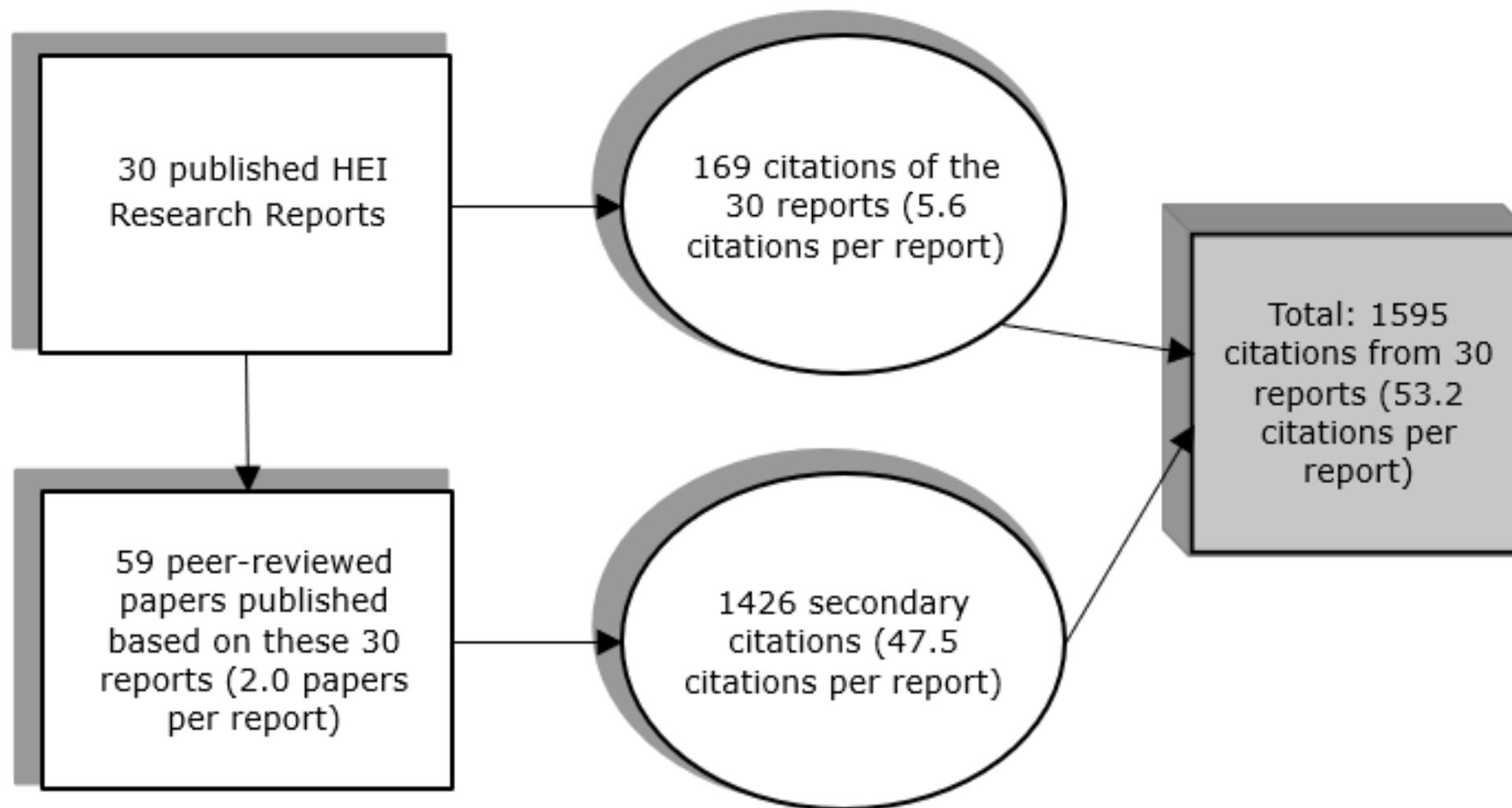
May 2019 **Public session at HEI annual meeting (May 7, 2019), comments invited**

June – October Revised Plan

Dec-Jan Plan adopted by HEI Board

Final HEI Strategic Plan effective April 1, 2020

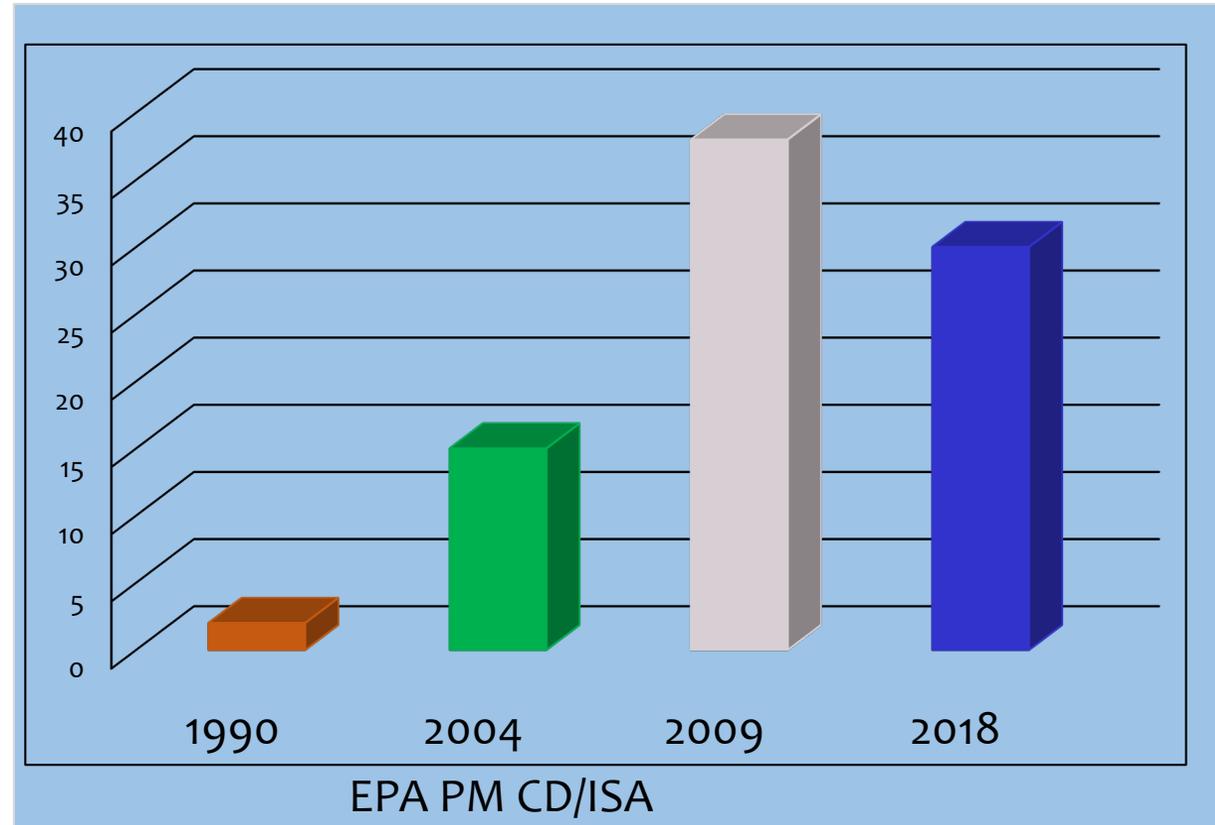
HEI's Impact on Science*



* Analysis based on reports published during 2015 – 2019

HEI Impact on Policy

(Number of HEI Reports cited in U.S. EPA PM NAAQS Documents)



Also, extensive communication to:

- *US Governmental agencies and legislative bodies*
- *Public and private advisory bodies (e.g. NAS, IOM)*
- *International and national organizations and agencies (e.g. IARC, EU, China RAQM)*
- *Private sector associations and public interest groups:*

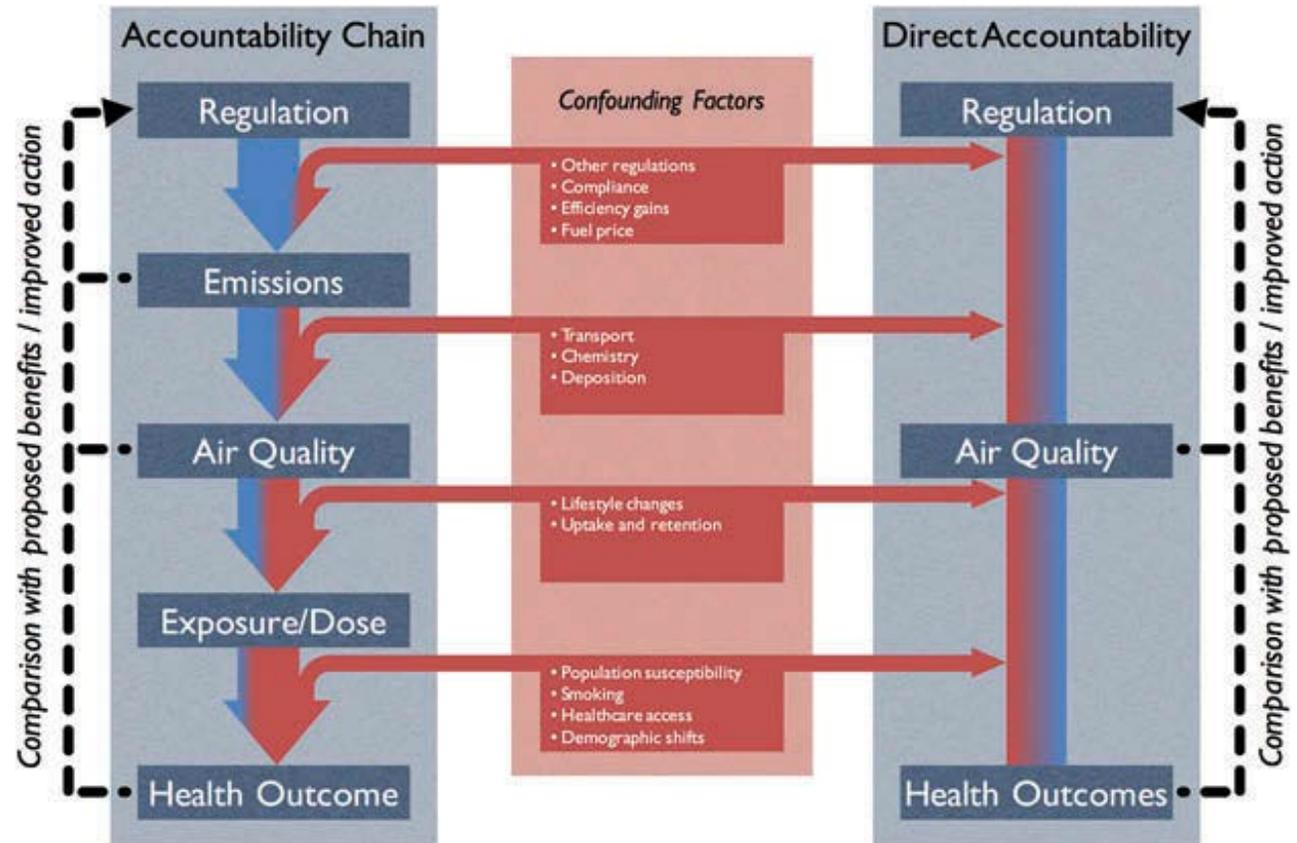
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Challenges and Opportunities: *Testing The Links Between AQ Action and Health*

Challenges:

- *Continuing Issue:* Can we better test (and quantify) what the air and health consequences are of AQ actions?
- How can examinations of AQ interventions help us analyze causal inference?
- Can these studies make for better cost and benefit analysis of future actions?



Source: Henneman 2017

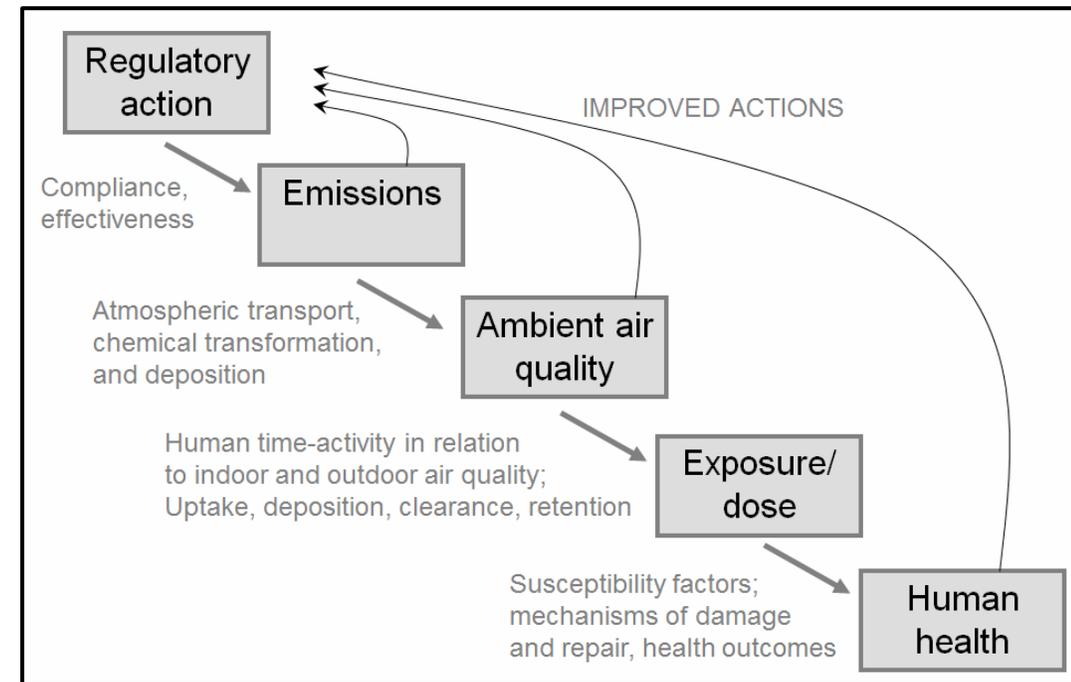
Opportunity: Next Gen Accountability Research

New HEI Request for Applications 18-1

- New RFA: “Assessing improved air quality and health from national, regional, and local air quality actions”
- Areas of particular interest
 - Long-term, complex regulatory programs
 - Interventions at the local level
 - Ports and global transport
 - Methods development
- Preliminary applications have been reviewed;
Full applications in May, review in June
New studies announced during summer; work underway in 2020
- 3 to 5 studies to be funded; total \$5 to 6 million for the program

Opportunity: Accountability Research?

- Are there other accountability initiatives we should consider?
 - Additional Recent AQ Actions that Could be Studied?
 - Planned future interventions?
 - Key methods to be developed?



Challenges and Opportunities: *Complex Questions for the Air Pollution Mixture*



Challenges

Ambient levels of air pollution in high income countries declining, but challenges endure. For example:

- New reports of association between below-standards air pollution exposure and health effects ; More research on-going
 - Are current standards sufficiently protective?
- Studies, including NPACT, report no clear cut characteristic of PM and health effects;
 - Questions about differential toxicity persist, driven partly by control options
 - Role of particle composition, source, size, surface, other
- New, low-cost sensors promise to democratize exposure assessment
 - Many challenges yet to overcome
 - Major new development but how to communicate the risk

Opportunity: Probing the Health Effects of Exposure to Low Levels of Air Pollution



- Three HEI studies, with key features:
 - Populations with millions in the US, Canada, and Europe; administrative and traditional cohorts
 - Satellite data and ground level exposure measurements; high quality exposure assessment models at high spatial resolutions
 - Development and application of novel statistical methods
 - Investigator teams with prior experience of productive collaborations
 - Initial Results in HEI Review – to be published this summer w/HEI Commentary
 - Full Reports in first years of the new plans
- Will there be key continuing questions to examine in latter years of the Plan?*

Opportunities: *Enhanced Exposure Assessment for the Air Pollution Mixture*

- HEI's new RFA 19-1 on exposure will seek and launch studies using sensors, other new techniques to measure exposure to hard to characterize pollutants (NO₂, UFP, etc.)
- ***Are there further opportunities to enhance exposure assessment?***
 - *Other pollutants to be studied?*
 - *Other measurement techniques to be assessed?*

REQUEST FOR APPLICATIONS 19-1

RFA 19-1: APPLYING NOVEL APPROACHES TO IMPROVE LONG-TERM EXPOSURE ASSESSMENT OF OUTDOOR AIR POLLUTION FOR HEALTH STUDIES

INTRODUCTION

The Health Effects Institute (HEI) is seeking to fund research to develop and apply novel approaches to improve long-term (months to years) exposure assessment of outdoor air pollutants whose levels vary greatly in space and time, such as ultrafine particles, certain major components of fine particulate matter (PM_{2.5}), oxides of nitrogen, and ozone. Request for Applications (RFA) 19-1 solicits applications for studies designed to quantitatively evaluate exposure measurement error and to determine the potential impact of using novel approaches to assess exposures to air pollution on health estimates. The approaches of interest include, but are not limited to:

- (1) **Harnessing novel measurement technologies:** air pollution sensors, mobile monitoring, location tracking, and other technologies that are increasingly being used to measure air pollution and human activity at fine spatial and temporal scales;
- (2) **Exposure assessment modeling approaches:** hybrid models, machine learning, and other statistical techniques.

RFA 19-1 addresses one of the major challenges in conducting epidemiological studies of long-term exposure to air pollution, which is the difficulty of accurately assigning exposures to each study participant and quantifying the influence of exposure measurement error on estimated health risks. Assessing the health effects of outdoor air pollutants that highly vary in space and time is made more complex by the lack of long-term datasets that are highly resolved both in space and time. This RFA will support studies that collect and evaluate new sources of air pollution exposure information for direct application to health studies. The focus of the RFA is on long-term exposures because these exposures constitute the largest knowledge gap and long-term exposure and health studies are considered more important for risk and burden assessments.

HEI expects to make available \$4 million for this RFA and to fund up to five studies of 2 or 3 years in duration (funding cap for each study will be \$800,000).

Complex Questions for the Air Pollution Mixture Opportunities for Research

- Laboratory Studies of Mechanisms of Low Exposure Levels
 - Can toxicological/mechanistic studies shed light on low exposure health observations?
- Characteristics of PM – Are there differences?
 - Epidemiological studies likely very difficult
 - Can toxicological/mechanistic studies provide some insights?
- MOSES did not detect cardiovascular effects upon exposure to near ambient levels of exposure
 - But epidemiological studies show effects on cardiovascular mortality
 - Is there more to be done to explore this?
- ***Are there other key mixture questions for HEI's attention?***

Challenges and Opportunities: *Transport and Urban Health*

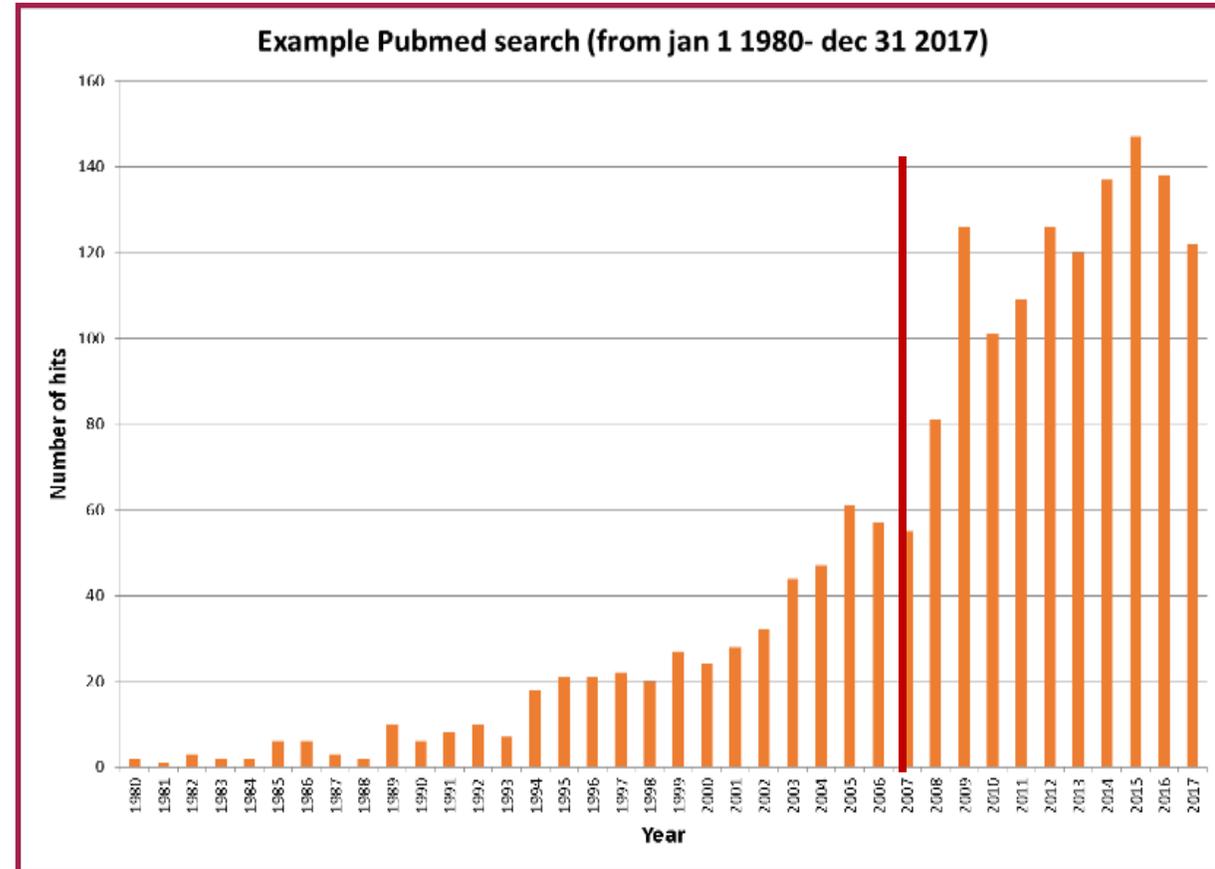
Challenges

- A Host of new Technologies – EVs, AVs, TNCs – changing the future of Transport
 - Driven in part by GHG
- But continued trends for many years to come in US, Europe, Asia:
 - Long-lived internal combustion engines, especially GDI
 - Questions about NO_x, UFP, in-use, non-tailpipe
 - Continued pressure to tighten standards
- And a growing focus on other factors: noise, socioeconomic status, access to green space, others



Opportunity: *New Review of the Traffic Literature*

- HEI published a comprehensive review in 2010, highly downloaded
- Strong interest in an update of the review from sponsors → 2015-2020 Strategic Plan
 - Substantial new research published
 - Also, trends in mobile source pollution, as regulations and technologies have advanced, and their potential implications
- A new panel *systematically reviewing* new epidemiologic studies: health endpoints, exposures, effects of noise, SES, green space.
- Panel has developed a specific protocol and begun literature searches and data extraction.
- Intensive work will continue during 2019; report ready for peer review 2020; published by mid-2021
- ***Will Identify the Most Pressing Next Traffic Research Gaps to Fill***



Opportunity: *The Next Phase of Traffic Research*

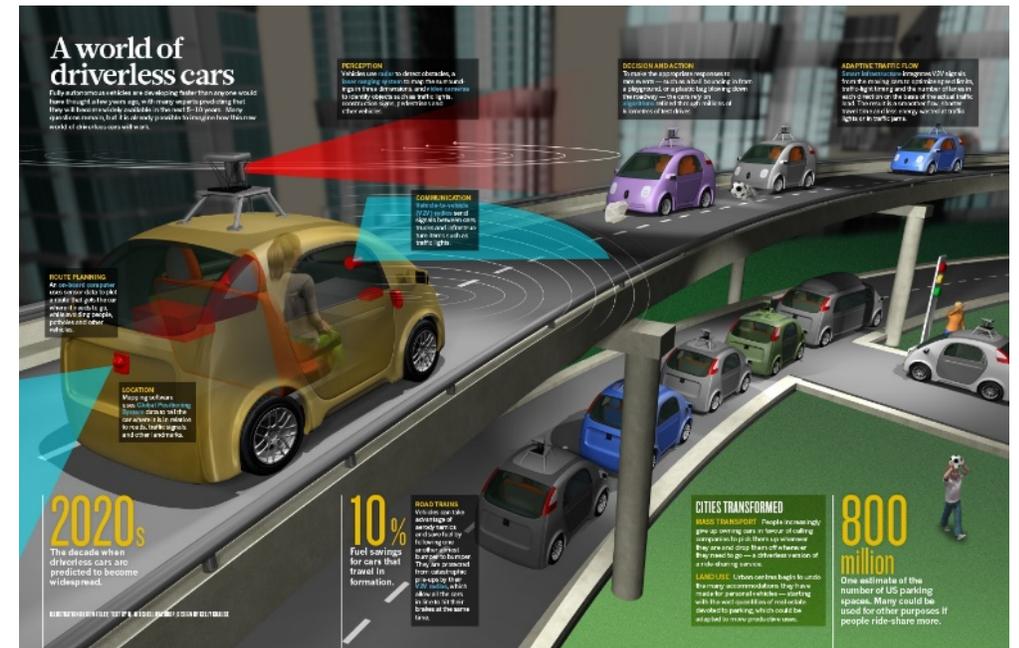
Placing Transport Air Pollution in its Context:

- *2017 RFA: Assessing Adverse Health Effects of Exposure to Traffic-Related Air Pollution, Noise, and Their Interactions With Socio-Economic Status*
- New studies funded:
 - Traffic-related air pollution and birth weight (Dadvand and Sunyer, ISGlobal)
 - Non-tailpipe emissions and noise from traffic and children's health (Franklin, University of Southern California)
 - Air pollution components, noise and socio-economic status (Raaschou-Nielsen, Copenhagen University)
 - Scalable multi-pollution exposure assessment using routine mobile monitoring platforms (Josh Apte, University of Texas, Austin) [Rosenblith Investigator]
- Studies started in 2018 – Three year studies + time for review and publication

Opportunity: *Further Traffic Research?*

Are there other traffic focused research priorities for the future?

- How best to build in effects of improving technology?
- Are there studies to be done about New Mobility?
- Are there other factors that might modify or confound traffic effects?



Challenges and Opportunities: *Global Health*



Challenges

- Continued very high levels in countries around the world
 - Globally air pollution 5th highest risk factor for mortality
 - Over 90% live in areas above WHO Guidelines
- Major standards setting and source control getting underway
 - But often a lack of understanding on which sources need control
 - A need to place transport in the context of other sources: coal, household burning, others

Opportunities: *Future Progress on Global Health*

- Continued Foundation Support from Bloomberg, Hewlett and other Foundations
- ***Global Burden of Disease*** the gold standard for systematic analysis of all health risks
- HEI's ***State of Global Air*** (www.stateofglobalair.org) tracks and communicates current pollution, trends
- ***Global Burden of Disease from Major Air Pollution Sources*** (GBD MAPS) now going global – to every country in the world

Are there other opportunities?

Other parts of the world on which to focus?

The screenshot shows the homepage of the 'State of Global Air 2019' website. The header includes the title 'STATE OF GLOBAL AIR /2019' and navigation links: 'HOW CLEAN IS YOUR AIR?', 'IMPACT ON YOUR HEALTH', 'EXPLORE THE DATA', 'READ THE REPORT', and 'ENGAGE'. There are also social media icons for Facebook and Twitter, and a '+ SHARE' button. Below the header, the HEI and IHME logos are displayed. The main content area features a blue background with a globe and four prominent call-to-action buttons: 'How clean is the air you breathe', 'What is the impact on your health', 'Explore the interactive data', and 'Read the report'. At the bottom, there are three columns of text providing additional information about the report, its audience, and the latest updates for 2019.

STATE OF GLOBAL AIR /2019

HOW CLEAN IS YOUR AIR? IMPACT ON YOUR HEALTH EXPLORE THE DATA READ THE REPORT ENGAGE

f t + SHARE

HEI IHME

Your source for the latest global, regional, and country-specific data on air quality and health.

How clean is the air you breathe »

What is the impact on your health »

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What is the State of Global Air?
A site that offers the most recent information from the Global Burden of Disease project and analysis on levels and trends in air

Who is it for?
Citizens, journalists, policy makers, and scientists will find information on human exposure to outdoor and household air pollution and their impacts on health.

What's new in 2019?
This year's analysis includes air pollution's impact on life expectancy.

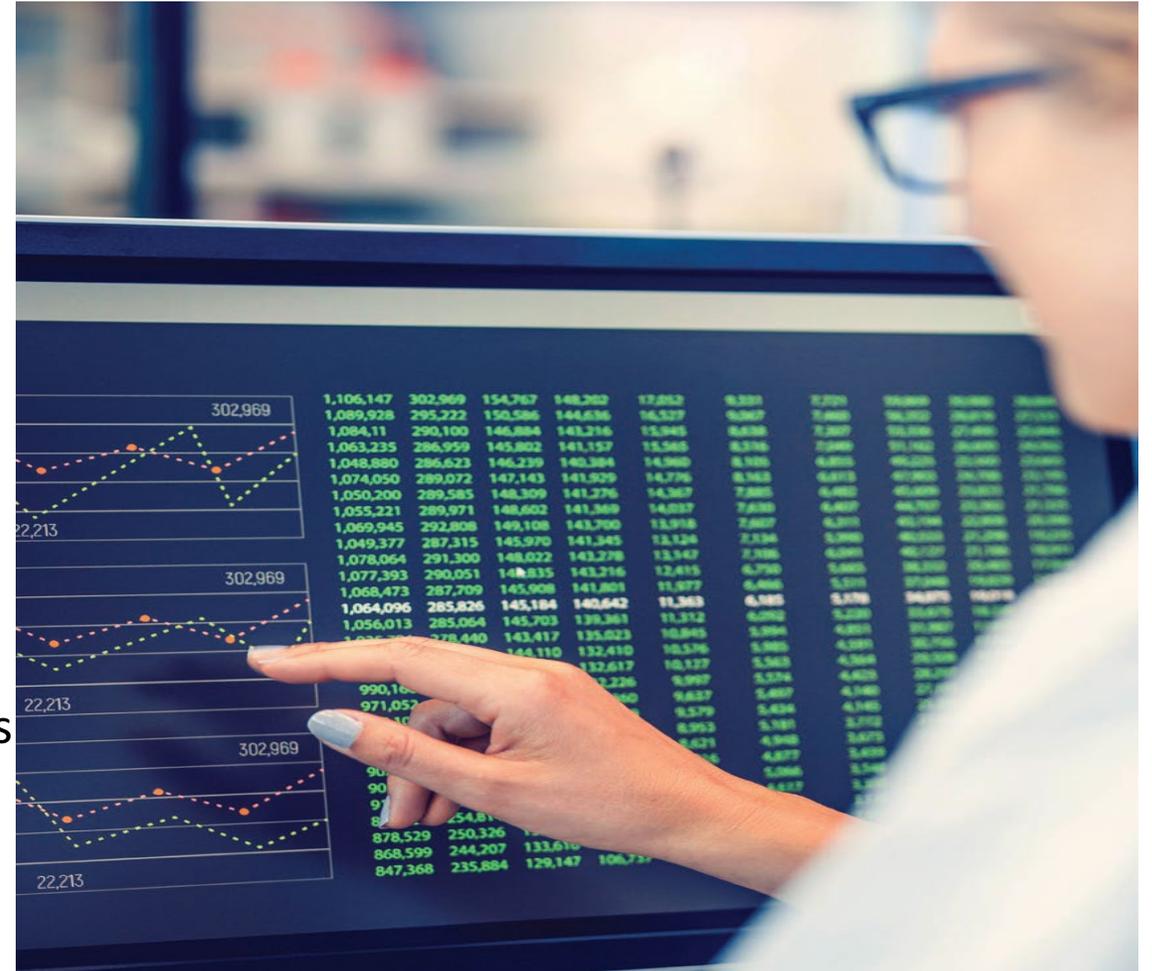
A major Cross-Cutting Issue: *Transparency in Policy-Relevant Science*

Challenges:

- Continued need to enhance data sharing for full transparency
 - “Big Data” both an opportunity and a challenge
- Systematic reviews must be truly systematic, and tested for bias
- Causal determinations need to be made in most rigorous way possible
 - Drawing on all lines of evidence

Opportunities

- HEI supporting new “data hubs” for making all underlying data accessible
- New systematic reviews underway at HEI – as models
- Opportunity for research with new causal inference methods in upcoming HEI Low-Level and Accountability Studies
- ***Other opportunities?***



Cross-Cutting Issues to be Integrated Into All HEI Science

Enhanced Exposure Assessment

Sensitive/At-Risk Populations

New methods: toxicity testing, mechanisms, biomarkers

Alternate Statistical Models, causal inference

Other??????

Building a New Strategic Plan

Next plan effective 2020 – 2025

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- | | |
|----------------|--|
| Winter 2018-19 | Visits to individual sponsors, stakeholders, science community |
| March 2019 | Sponsor meeting with Research Committee to hear recommendations |
| April 2019 | First Draft Plan, many options, circulated to sponsors for comment |
| May 2019 | Public session at HEI annual meeting (May 7, 2019), comments invited |
| June 2019 | <i>We would welcome your comments by June 4, 2019</i> |
| Fall 2019 | Revised Plan |
| Dec-Jan | Plan adopted by HEI Board |

Final HEI Strategic Plan effective April 1, 2020

Choosing the Future

Major Opportunities

- Testing the Links Between Air Quality Actions and Health
 - New and continued innovation in Accountability Studies
 - To inform decisions on benefits, causality
 - Targeting national and source-specific improvements in AQ
- Enhancing Understanding of the Air Pollution Complex Mixture; informing Ongoing air quality standards and guidelines decisions
 - Effects of long-term exposure to low levels of air pollution
 - Enhanced exposure to NO₂, UFP, and other key pollutants
 - Further analyses of PM Sources?
 - Mechanistic research
- Transportation and Urban Health
 - Reviewing the latest literature
 - Studying transport emissions in the context of SES, noise, green space
 - Sensitive populations
 - Exposure components of special interest
- Global Health
 - Understanding the Sources and their burdens
 - Tracking the State of Global Air
- Cross-cutting issues

Strategic Planning Process

Input from:

- Sponsors
 - EPA
 - motor vehicle industry
 - oil and other industries
- The Scientific Community
- State Agencies (e.g. CARB)
- The Environmental Community
- International Agencies
- Others

Selection Criteria:

- importance to regulation/technology (short and long term)
- importance to science
- work of others
- possibility of a scientific contribution

The HEI Strategic Plan

2020 – 2025



Lower Priority Items (To Be Monitored)



THANK YOU!

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