Urban Air Quality Management

The United States Experience

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Outline

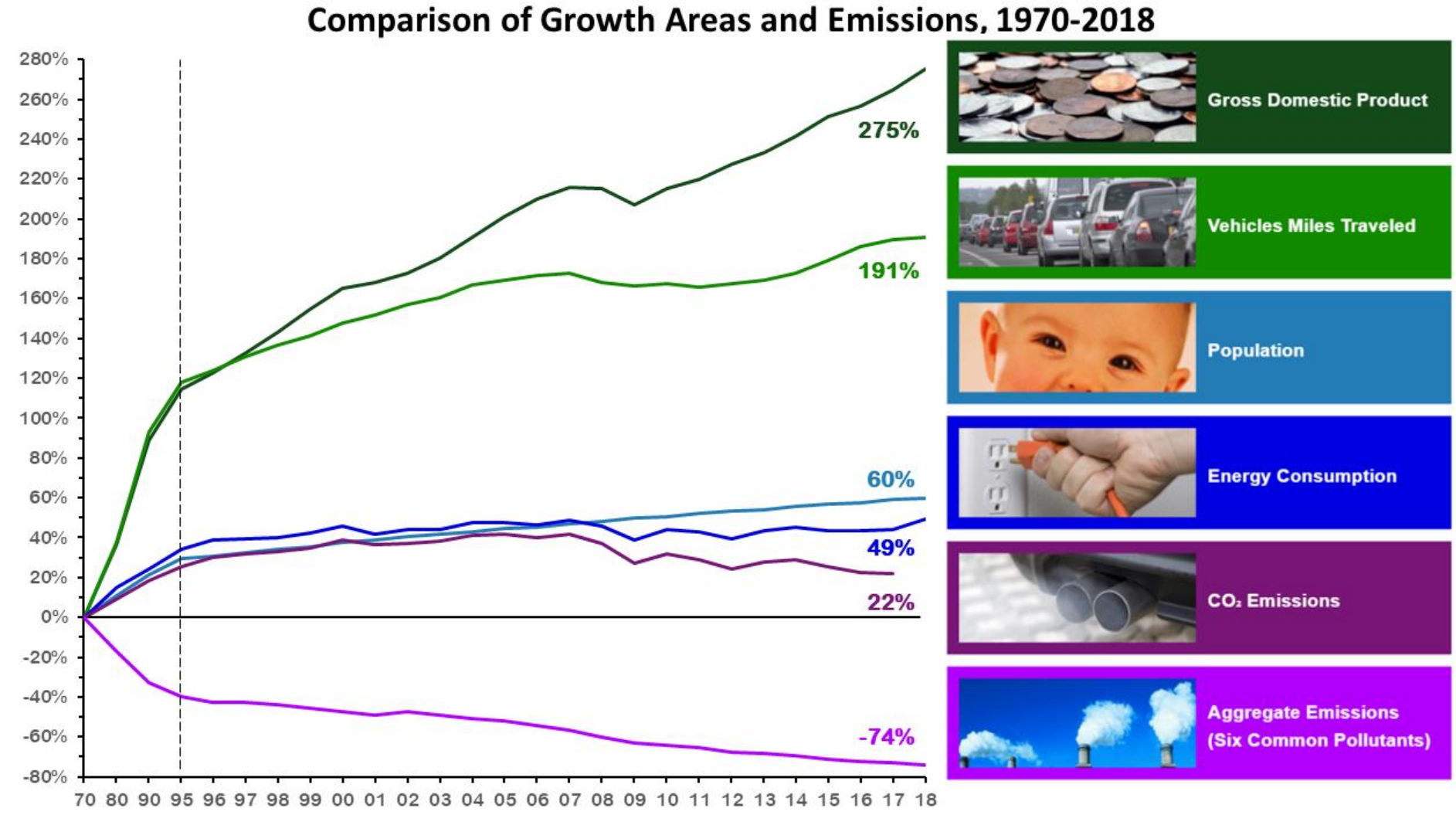
- Key messages
- Air quality management cycle
- Trends in emissions and air quality
- Benefits and costs of the Clean Air Act Amendments of 1990
- Features of the US Air Quality Management System
  - Focus on State Implementation Planning
- Translating the US Experience Internationally: The Megacity Partnership framework for air quality management

Key Messages from the US Experience

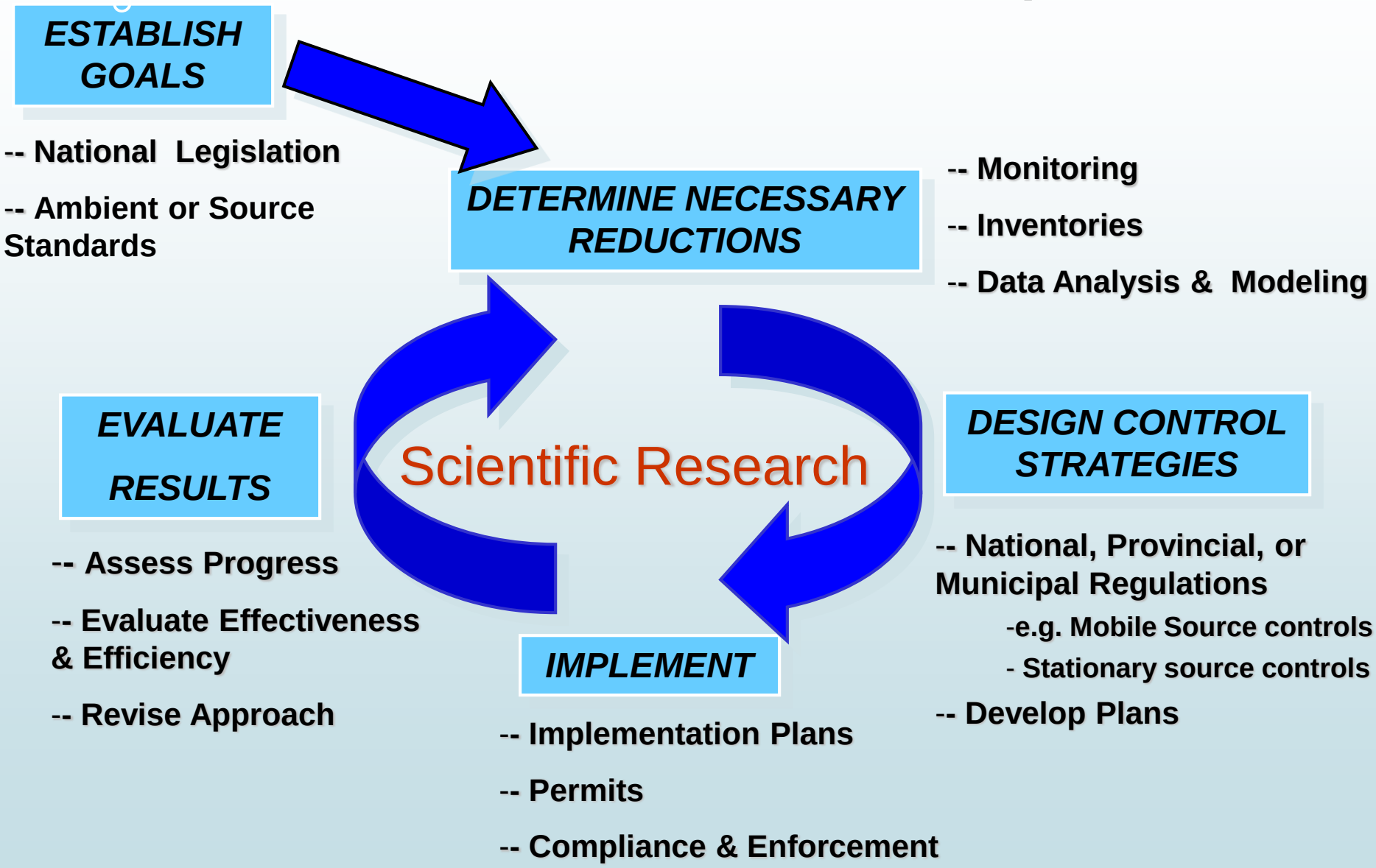
- Clean air and a strong economy can happen together.
- Air quality management is a continuous cycle of development and improvement with a goal of improving public health and the environment.
- Success depends on strong Federal – State Partnership. National, regional and local regulations, along with voluntary and market-based programs, are effective in achieving reductions
- Regional cooperation is critical for controlling air pollution that affects multiple cities and states, such as $PM_{2.5}$, ozone and regional haze
- Providing accurate, scientifically valid information to the public enables them to play a key role in achieving standards and improving public health

US Trends In Emissions and Air Quality

Economic growth and emission reductions go hand in hand



The U.S. Air Quality Management System: A Federal- State Partnership



Key Roles and Responsibilities

Federal Government	State Governments
• Sets air quality standards • Designates areas as attainment, nonattainment, or unclassifiable • Establishes national controls for certain source categories that states cannot regulate (e.g., mobile sources) • Promulgates regulations to address interstate transport of pollution • Develops guidance to interpret rules and Clean Air Act (CAA) requirements • Reviews pre-construction and operating permits • Approves and enforces SIPs	• Recommend designation of areas • Develop emission inventories • Operate air quality monitoring networks • Perform air quality modeling and identify emissions control strategies needed to attain standards • Adopt legal infrastructure for air quality program • Adopt the necessary control measures into their SIPs • Enforce regulations • Issue pre-construction and operating permits

National Standards and Regulations

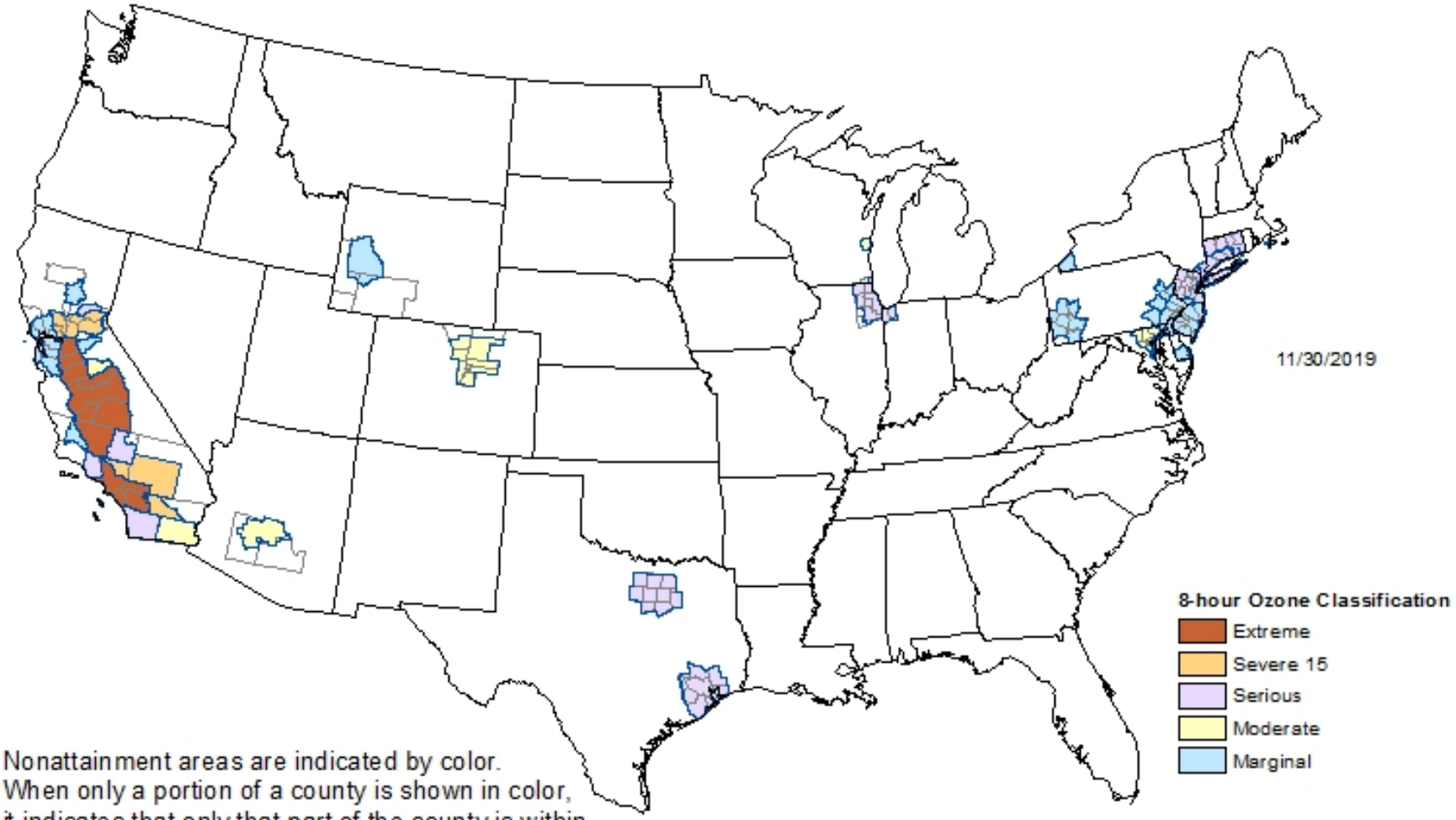
- National Ambient Air Quality Standards
  - Monitoring and Implementation Regulations
- Technology Based Emission Standards
  - For both large and small stationary sources
  - Toxic pollutants
  - New Source Performance Standards
  - Existing Source Guidelines
- Fuel and Vehicle Standards

Designation of Nonattainment Areas

After NAAQS are revised, EPA designates nonattainment areas

- States submit to EPA a list of recommended nonattainment areas based on five factor analysis:
  - air quality data (3 most recent years),
  - emissions and emissions-related data,
  - meteorology,
  - geography/topography, and
  - jurisdictional boundaries.
- Nonattainment area include one or more violating monitors and nearby areas with emissions that contribute to the violation of the standard
- EPA makes the final decision on the appropriate nonattainment area boundaries

8-Hour Ozone Nonattainment Areas (2008 Standard)



Nonattainment areas are indicated by color.
When only a portion of a county is shown in color, it indicates that only that part of the county is within a nonattainment area boundary.

PM-2.5 Nonattainment Areas (1997 Standard)

Nonattainment areas are indicated by color.
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it indicates that only that part of the county is within
a nonattainment area boundary.

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PM-2.5 Nonattainment Areas (2012 Standard)

Nonattainment areas are indicated by color.
When only a portion of a county is shown in color,
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State Implementation Plans

Designating areas, State Implementation Plans, Demonstrations

- EPA designates areas as **attaining** or **not attaining** air quality standards
  - Nonattainment areas include **violating** areas and areas **contributing** to violations
  - Additional **more stringent control** requirements can apply based on severity of pollution
- Once EPA has established air quality standards, States prepare **State Implementation Plans (SIP)**
  - Includes legal authorities, rules, and practices used to attain and maintain the standards
- Plans must demonstrate that area can **attain and maintain** air quality standards
- Plans impose **controls on individual sources** as necessary to attain and maintain the standards.

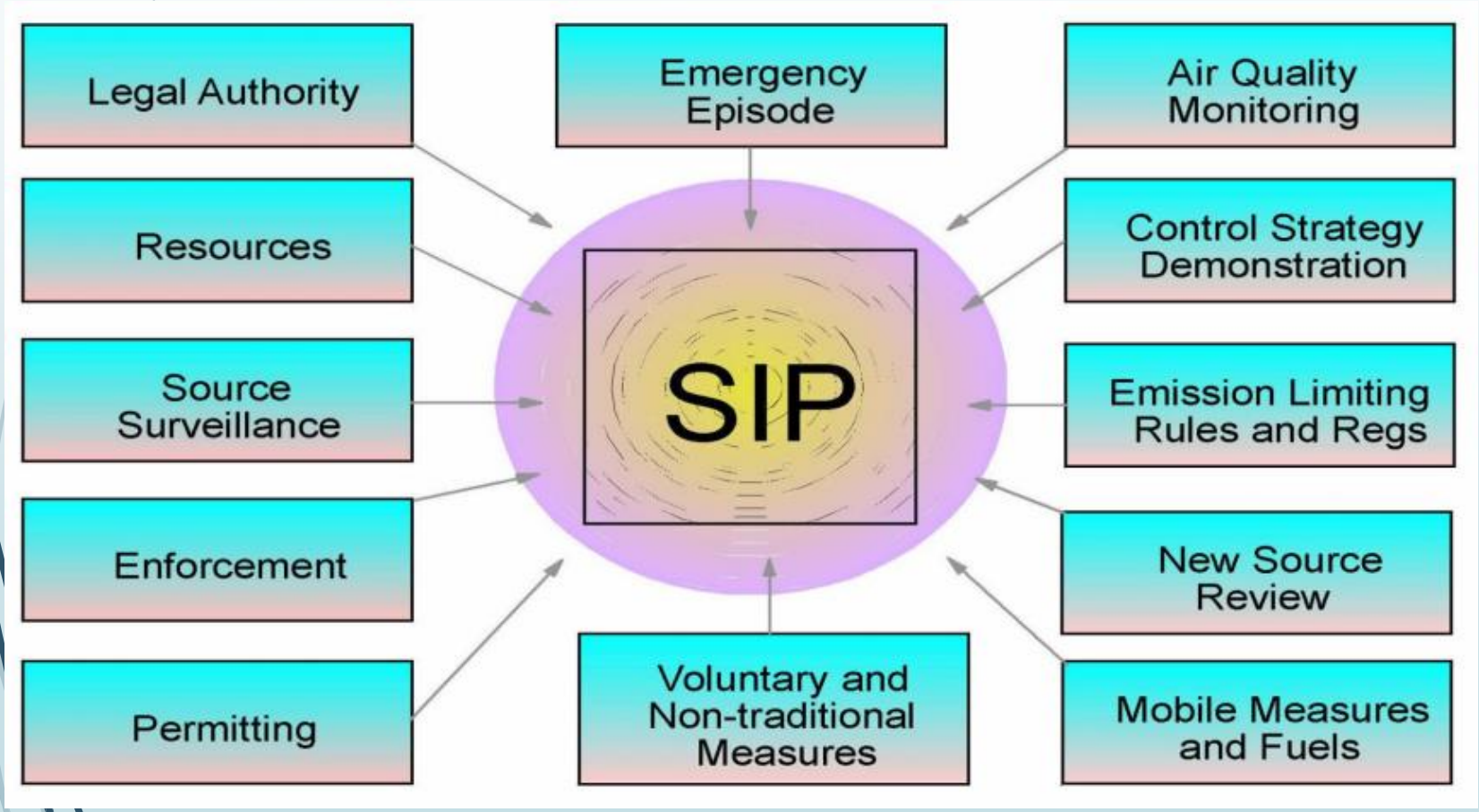
SIPs for Nonattainment Areas

After nonattainment areas are designated, states develop attainment plans

- For each nonattainment area, a State must submit an attainment plan **within 18-36 months** (varies by pollutant)
- A plan must demonstrate how an area will achieve the standard "as expeditiously as practicable"
  - Ozone (3-20 years); $PM_{2.5}$ (6-15 years)
  - Accounts for emission reductions from existing national/state regulations
  - Includes new regulations as needed for additional reductions from existing sources; and to prevent significant contribution to other "downwind" states
- State solicits public input on proposed plan through a public notice and comment process
- State submits plan to EPA for review and approval

Components of a SIP

- Revised by State as necessary
- Addresses unique air pollution problems in State.
- Keeping SIP updated is a continuous process.
- **A SIP is not one document**



State Implementation Plans

Elements of a non-attainment area plan

- Develop **detailed emission inventory** of sources
- Identify **existing federal & state controls**
- Evaluate technically and economically feasible **new controls on sources** in nonattainment area and state
- **Conduct air quality modeling** to evaluate air quality improvement from projected existing and new emission reductions
- **Adopt enforceable regulations and control measures**: emission limits, test methods, monitoring and reporting for specific sources
- **Ensure reasonable progress** toward attainment
- **Adopt contingency measures** to apply in the event the area fails to attain by its attainment date
- Include authority to stop air pollution that endangers public health (**emergency powers**)

EPA SIP Resources

- SIP Requirements in the Clean Air Act
- SIP Checklists
  - Particulate Matter SIP Checklist Guide
  - Ozone SIP Checklist Guide
- Menu of Control Measures for SIPS
- Approved Implementation Plans
  - SIPs, FIPs and TIPs

NAAQS Implementation Milestones

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Pollutant	Final NAAQS Signature	Nonattainment Designations Effective	Infrastructure SIP Due	Attainment Plans Due	Attainment Date
$PM_{2.5}$ (2006)	Oct 2006	Dec 2009	Oct 2009	Dec 2014	Dec 2015 (Moderate) Dec 2019 (Serious)
Pb (2008)	Oct 2008	Dec 2010-2011	Oct 2011	June 2012-2013	Dec 2015-2019
$PM_{2.5}$ (2012)	Dec 2012	Apr 2015	Dec 2015	Oct 2016 (Moderate)	Dec 2021 (Moderate) Dec 2025 (Serious)
NO_2 (2010) (primary)	Jan 2010	Feb 2012	Jan 2013	N/A	N/A
SO_2 (2010) (primary)	June 2010	Oct 2013, Sept 2016, Apr 2018 (early 2021)	June 2013	Apr 2015, Mar 2018, Oct 2019 (mid 2022)	Oct 2018, Sept 2021, Apr 2023 (early 2026)
Ozone (2008)	Mar 2008	July 2012	Mar 2011	July 2015-2016*	July 2021-2032
Ozone (2015)	Oct 2015	Aug 3, 2018 (Sep 24, 2018 for San Antonio, TX)	Oct 2018	Aug 2021-2022	Aug 2021-2038

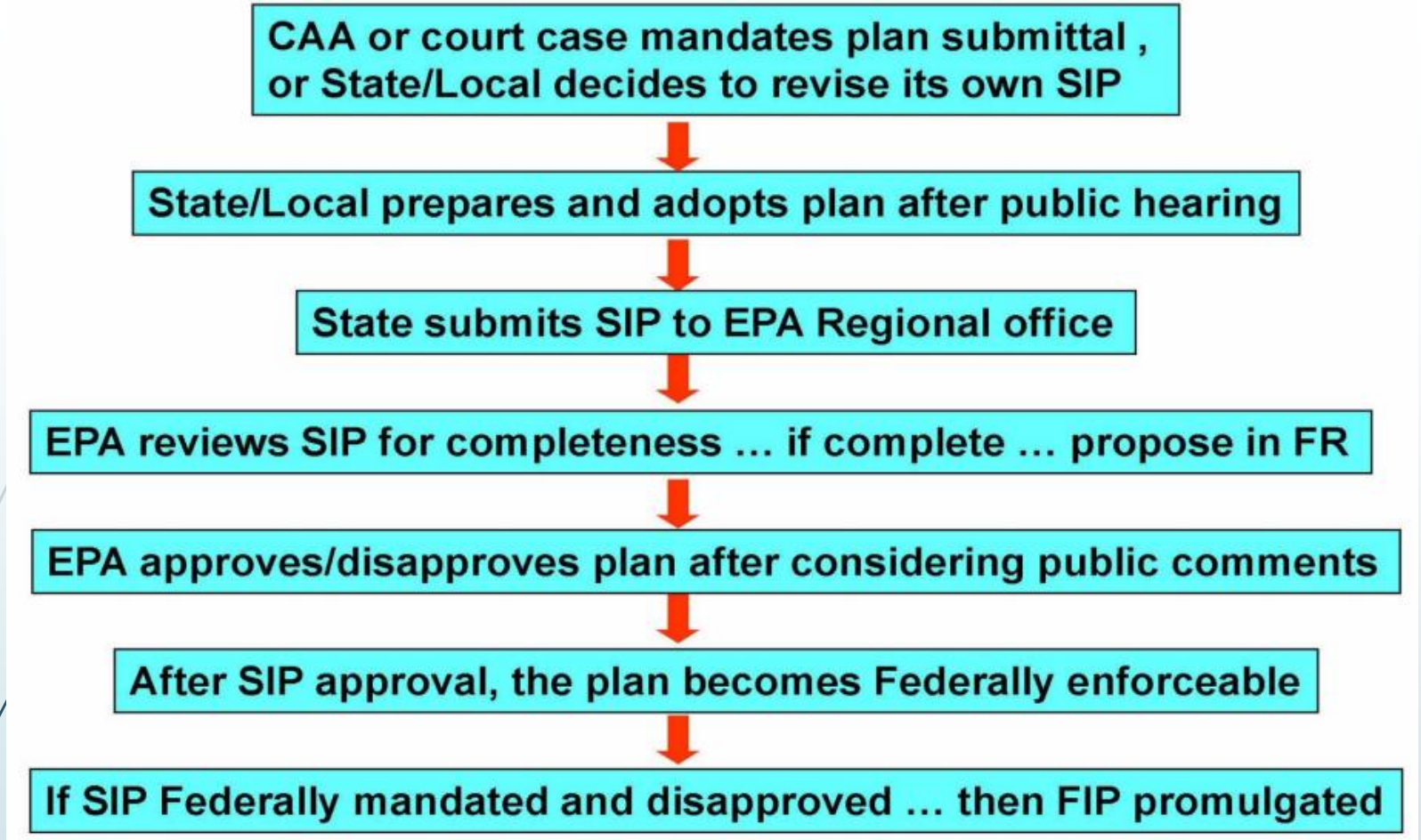
(November 2019)

* January 2017 for areas reclassified from Marginal to Moderate. August 2020 for areas reclassified from Moderate to Serious.

Failure to Submit SIP or Disapproved SIP

Clean Air Act mandatory sanctions after a "Finding" is made

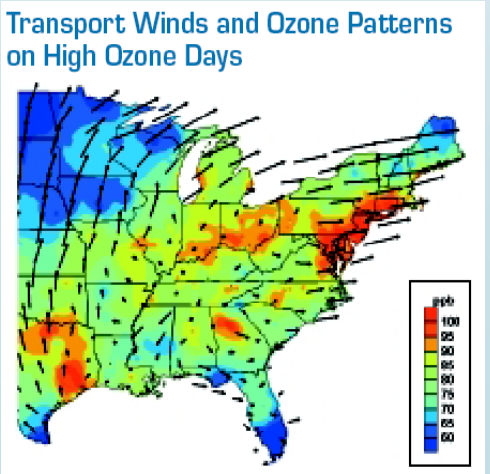
- Emission Offset Sanctions
  - After 18 months sanctions clock
  - Each ton of emissions created by a new stationary source of pollution is offset by a two ton reduction in existing stationary sources
  - Clock stops once a State submits a complete SIP within 18 months
- Highway funding sanctions
  - After 24 months sanctions clock
  - A state can lose certain funding for transportation projects
  - Clock stops once a State submits a complete SIP within 24 months
- Deadline to Issue Federal Implementation Plan (FIP)
  - 24 month sanction clock
  - EPA (not State) issues plan
  - Clock stops only when EPA approves SIP within 24 months



Summary of SIP Process

Requirements for Regional Pollution

- State implementation plans (SIPs) must address transport of pollutants to air quality problems in other states - "Good Neighbor" provisions
  - Each state plan must prohibit activities leading to interstate transport of air pollution that can interfere with the attainment and maintenance of the air quality standards by another state
- State plans must provide controls necessary to prevent any **significant interference** with attainment or maintenance in downwind states



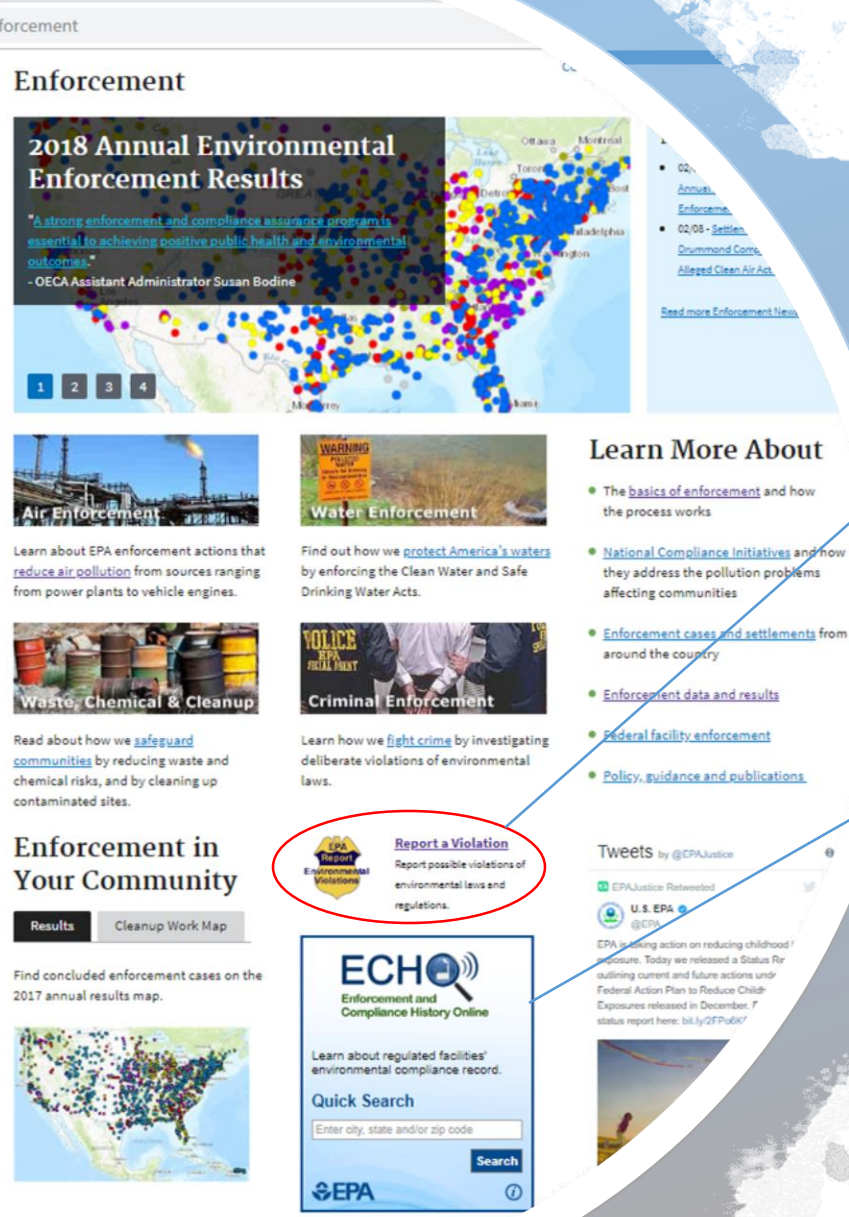
National Standards for Major Sources of Air Toxics

- Clean Air Act requires EPA to develop technology-based national emissions standards for categories of major industrial sources
- Standards must at least reflect:
  - For new sources, best controlled similar source
  - For existing sources, the average emission limitation achieved by the best performing 12% of all existing sources
- More stringent standards may be required based on consideration of costs and non-air quality impacts
- These standards are commonly known as Maximum Achievable Control Technology (MACT) standards
- Include emission limits, testing / monitoring, recordkeeping, reporting requirements

Technology and Risk Reviews

- Every 8 years after MACT standards are developed, EPA must evaluate advances in practices, processes and control technologies.
  - If EPA identifies cost-effective approaches to further reduce emissions, EPA revises the MACT standards as appropriate.
- Within 8 years of the MACT standard, EPA must also perform a "Risk Review."
  - EPA evaluates the risk remaining after implementation of the technology-based standards
  - Set additional standards, if necessary to protect public health with an "ample margin of safety"

EPA's Enforcement Website

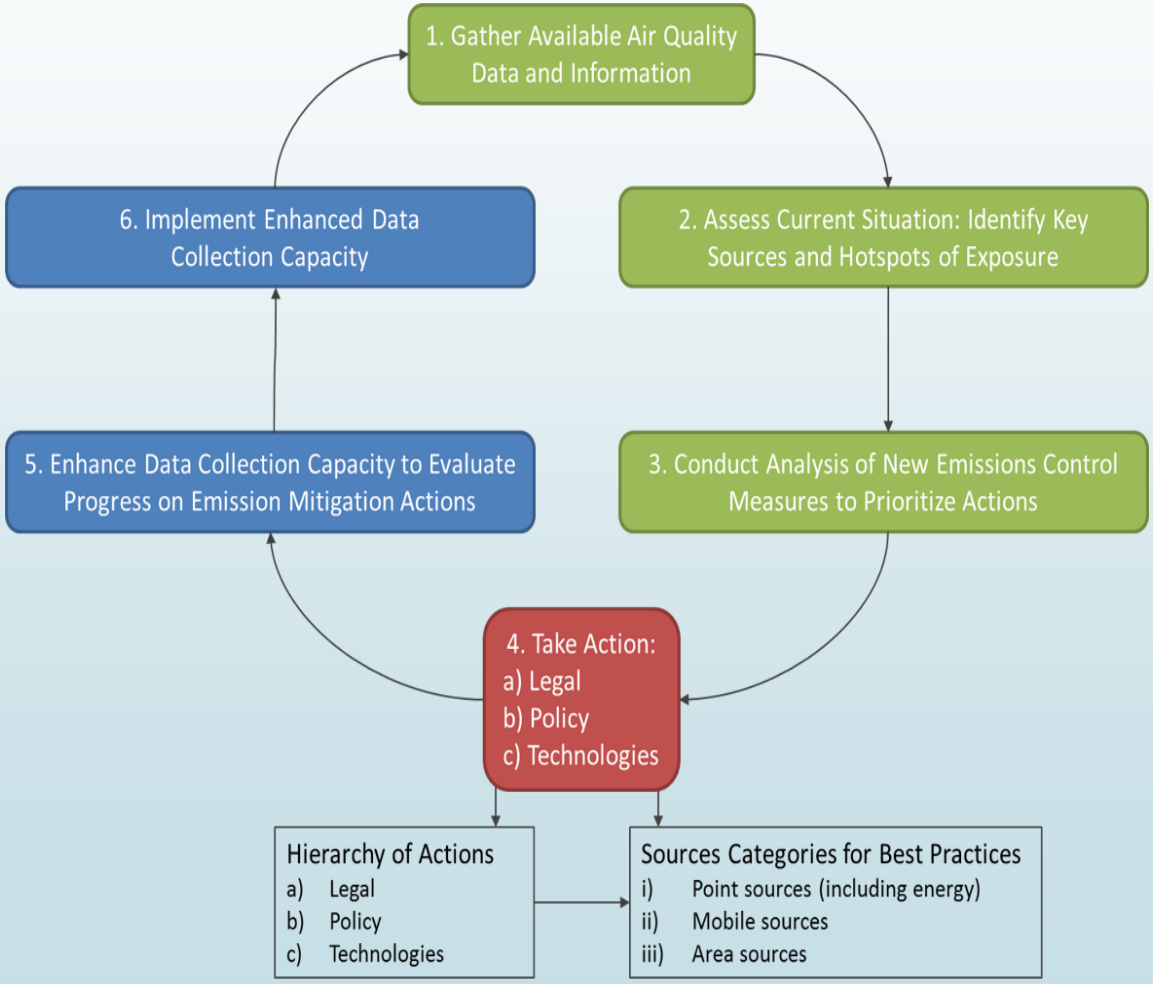


Anyone can report a possible violation of environmental laws and regulations

EPA's Enforcement and Compliance History Online website can be used to search for facilities to assess their compliance with environmental regulations. ECHO can be used to:

- Search for Facilities
- Investigate Pollution Sources
- Search for EPA Enforcement Cases
- Examine and Create Enforcement-Related Maps
- Analyze Trends in Compliance and Enforcement Data

Translating the US Experience into International Action



MEGACITIES PARTNERSHIP

Megacities Partnerships

- Partnerships to date:
  - Accra, Ghana – initiated September 2015
  - Santiago, Chile – initiated January 2017
  - Addis Ababa, Ethiopia – initiated February 2018
  - Lima, Peru – initiated September 2019
- Delivers support in basic air quality management principles
- Predicated on the idea that **there is enough data to act now**
- Develops capacity in freely available, EPA-supported analytical tools
- Leverages key partnerships with other organizations
  - CCAC SNAP Initiative – Stockholm Environment Institute
  - World Bank Pollution Management and Environmental Health Program
  - WHO/CCAC Urban Health Initiative
  - Global Alliance for Clean Cookstoves
  - UNEP
- Working toward regional sustainability

Megacity Framework

- Focus on country-specific capacity building with an eye toward regional leadership
- Scoping: Understand the lay of the land
  - Organizational structures, priorities, capacity and commitment
  - Air pollution, meteorology, household energy, transportation, sector data
  - Civil society and donor organizations and projects
  - Initial meetings with in-country officials and other organizations
- Information Collection and Review Report – Document the baseline
  - Summary of current conditions, emissions, trends, assessments etc.
  - Recommendations
- Data Request: Build the knowledge base
  - Identify data backstops if all local data does not materialize
- Inception Report: Agree upon and document the project plan
  - Approach and methodology
  - Schedule and specific next steps
  - Regularly revisit plan and schedule, being flexible
- Trainings and Materials: Be clear about goals, audiences and expectations
- Communications Templates: In parallel to other steps, not afterthought
- AQMP Template: Enables inquiry, while maintaining local ownership

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AQMP Template

5. Overall Objective and Goals of the AQMP

Establish an overall objective of the AQMP, for example:

> **"Ambient particulate air quality is brought into full compliance with national ambient air quality standards by 2022, and the state of compliance is maintained as the region develops economically."**

Establish goals by which the objective will be fulfilled, for example:

- ***Goal 1: Ambient concentrations of air pollutants comply with the relevant ambient air quality standards because of planned emission reductions***
- ***Goal 2: Cooperative governance promotes the implementation of the AQMP***
- ***Goal 3: Air quality management is supported by effective systems and tools***
- ***Goal 4: Air quality decision- making is informed by sound research***
- ***Goal 5: Knowledge and understanding amongst decision-makers, stakeholders, and the general public is improved according to an education and outreach plan***

Implementation Plan

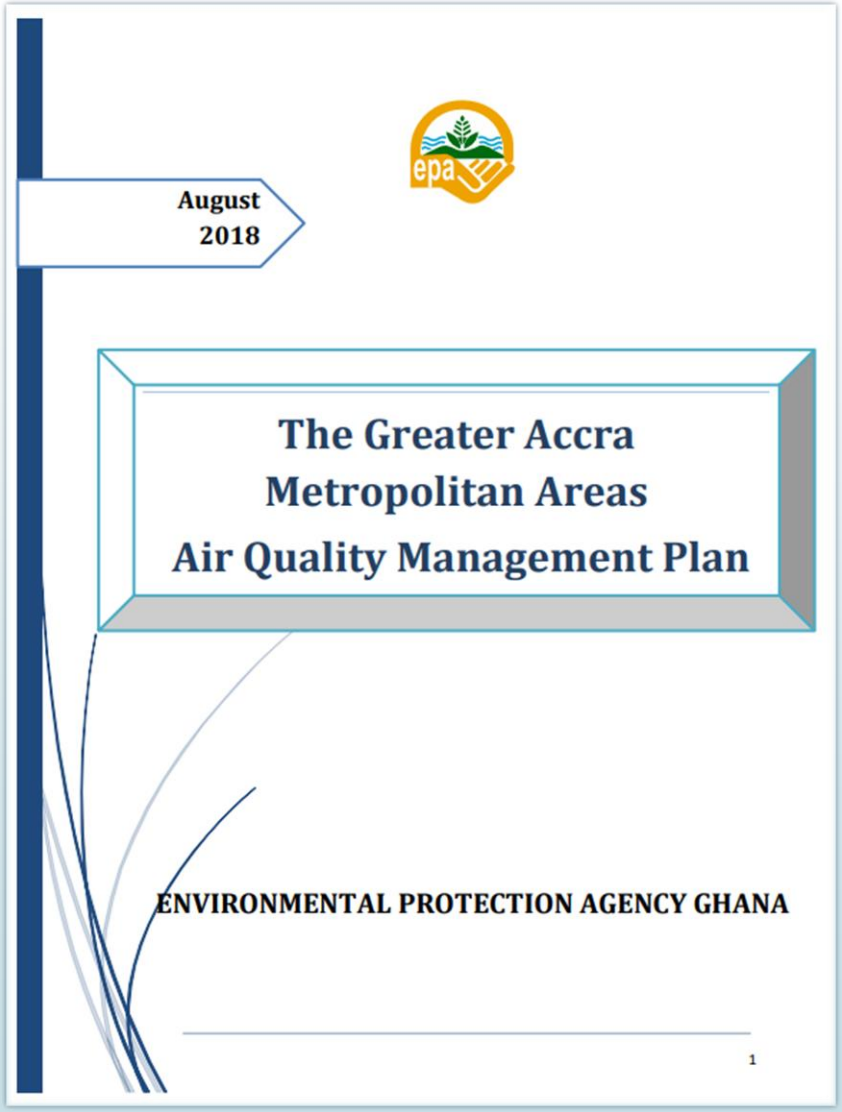
GOAL 1 AMBIENT CONCENTRATIONS OF AIR POLLUTANTS COMPLY WITH THE RELEVANT AMBIENT AIR QUALITY STANDARDS BECAUSE OF PLANNED EMISSION REDUCTIONS					
OBJECTIVES	ACTIVITIES	MANDATORY RESPONSIBILITY	PARTICIPATORY RESPONSIBILITY	TIME-FRAMES	INDICATORS
Update ambient standards					
Reduce emissions from personal vehicles					
Reduce dust from unpaved roads					
Reduce emission from industrial sources					
Reduce open burning emissions					

1. Begin with stated goals
2. Outline individual objectives necessary to reach goals
3. Identify main and participatory partners
4. Proposed timeframe for completion
5. Identify indicators of success

Results in Ghana

Estimates of premature mortality associated with particulate matter exposure in the Greater Accra Region for 2015, 2020, & 2030

Health Endpoint	Epidemiological Study	Age Range	2015 Air Pollution Attributable Incidence	2020 Air Pollution Attributable Incidence	2030 Air Pollution Attributable Incidence
Mortality, Chronic Obstructive Pulmonary Disease	Cohen et al., 2015	30-99	210	230	350
Mortality, Ischemic Heart Disease	Cohen et al., 2015	25-99	810	870	1300
Mortality, Cerebrovascular Disease	Cohen et al., 2015	25-99	590	660	970
Mortality, Lower Respiratory Infection	Cohen et al., 2015	30-99	1200	1300	1900
Mortality, Lung Cancer	Cohen et al., 2015	30-99	47	55	84
Total Mortality for Causes Listed Above			2800	3100	4600



Details and methodology included in GAMA AQMP:
http://www.epa.gov.gh/epa/documents/greater-accra-region-air-quality-management-plan

Successful Air Quality Management

- Good quality science and analytical information on the nature, sources, and impacts of air pollution
- Shared understanding of the problem among major stakeholders (pollution sources, political leaders, environmental officials, public interest groups, citizens)
- Active involvement of stakeholders and shared commitment to improve air quality
- Shared burden of control across contributing sources and regions
- Leadership at national level to enable participation, set fair levels of control, and resolve conflicts between stakeholders
- Defined roles for each level of government involved
- Strong penalties, clear accountability, and strict enforcement at the national, state, and local levels

THANK YOU!
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For further information:

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