

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Tools to Support Integrated Air Quality and Climate Planning

Johan Kuylenstierna
SEI Research Leader
CCAC SAP

Chris Malley
SEI Research Fellow



Key Issues and Messages

1. Policy development is enhanced by quantitative analyses
2. Who develops the analysis matters
3. The analysis needs to be embedded within broader policy development process
4. Strengthening link between air quality and climate change planning creates coherent policies and can enhance ambition
5. Capacity needs to be built to undertake analyses in national institutions
6. Practical and flexible tools need to support national planning

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Insights come from work under the CCAC SNAP Initiative



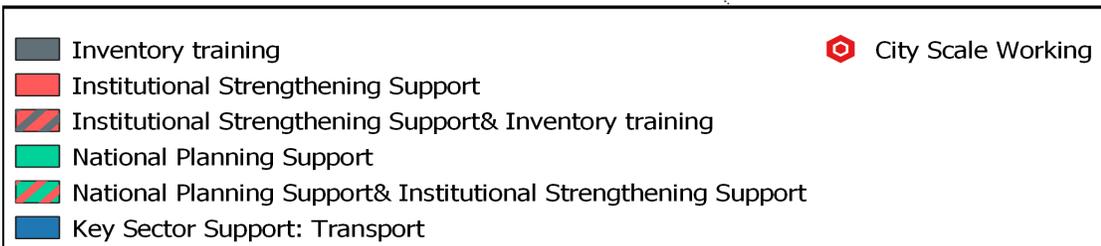
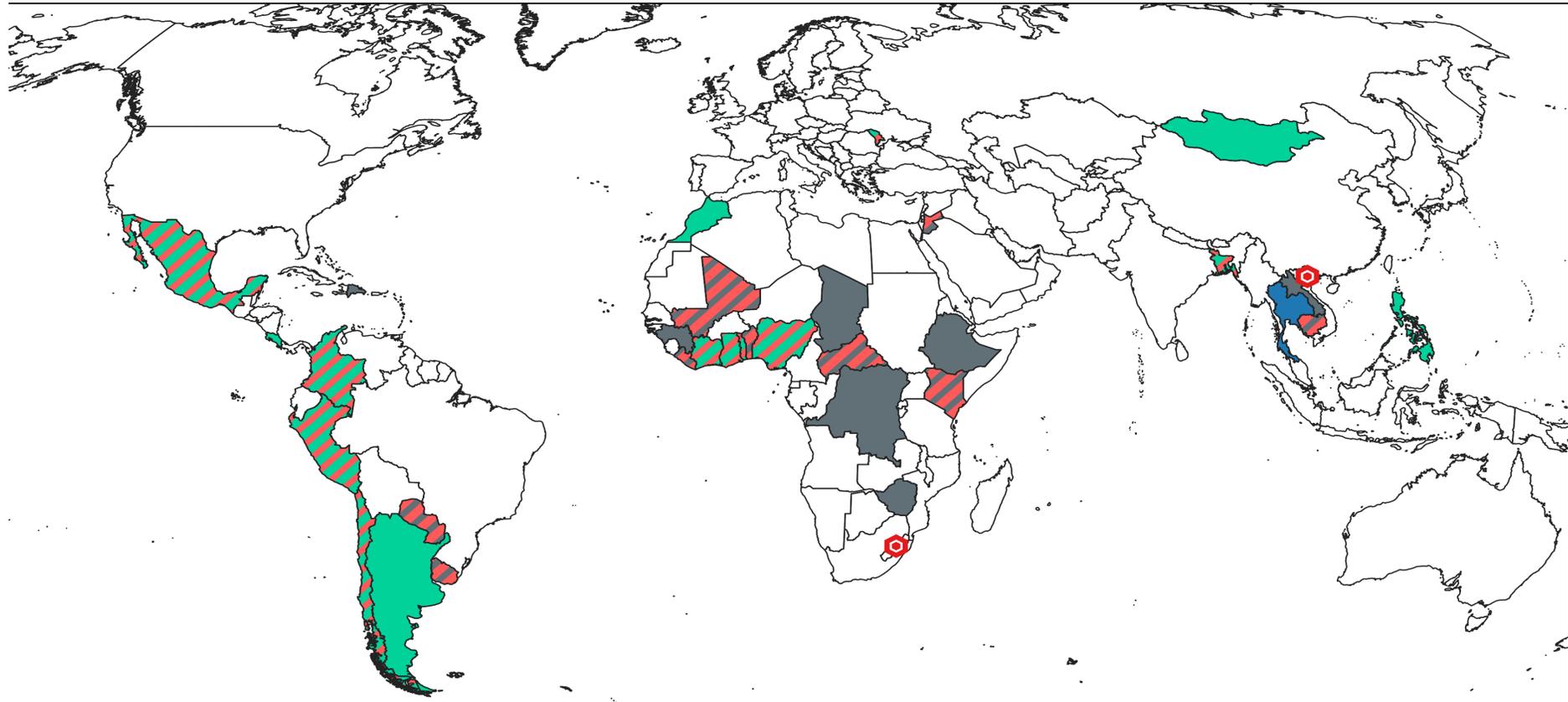
Component 1: Technical assistance to countries on integrated planning on air pollution and climate change mitigation and SLCP reductions

Component 2: Identify, disseminate and promote exchanges within and outside the Coalition on the best SLCP planning practises identified:

- ❑ Improving existing tools and guidance
- ❑ Providing streamlined training and wider exchange of experience
- ❑ Engaging regional and global institutions, as well as countries

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Countries receiving support from SNAP and using LEAP-IBC



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Finalised National Plans



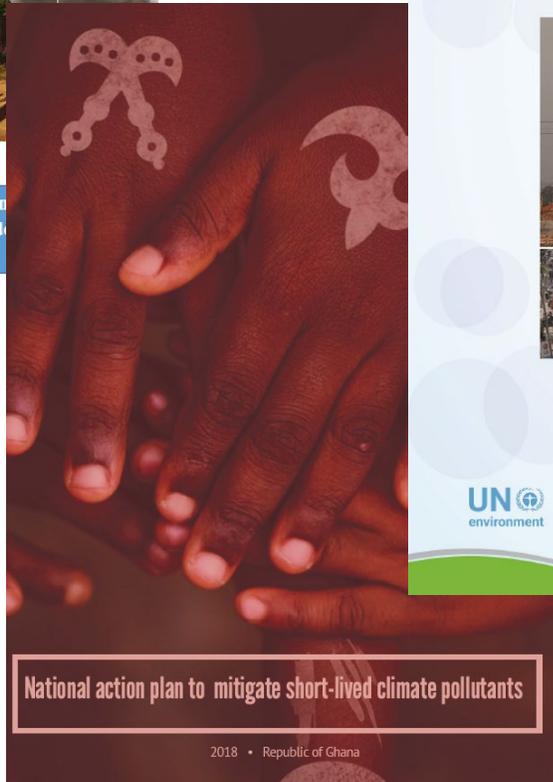
République togolaise



Plan national de réduction
atmosphériques et climatiques de
du Togo



2019-2024

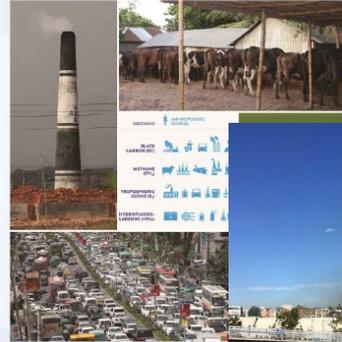


National action plan to mitigate short-lived climate pollutants

2018 • Republic of Ghana



Bangladesh National Action
Plan for Reducing Short-Lived
Climate Pollutants (SLCPs)



June 2018

Department of Environ
ment, Ministry of Environment, Forest and
Government of the People's Republic



Estrategia nacional para
contaminantes climáticos



GOBIERNO
DE COLOMBIA



MINAMBIENTE

Ministerio de Ambiente y Desarrollo Sostenible

Dirección de Asuntos Sectoriales, Ambiental y Urbana

Dirección de Cambio Climático y Gestión del Riesgo

Con la colaboración técnica de:



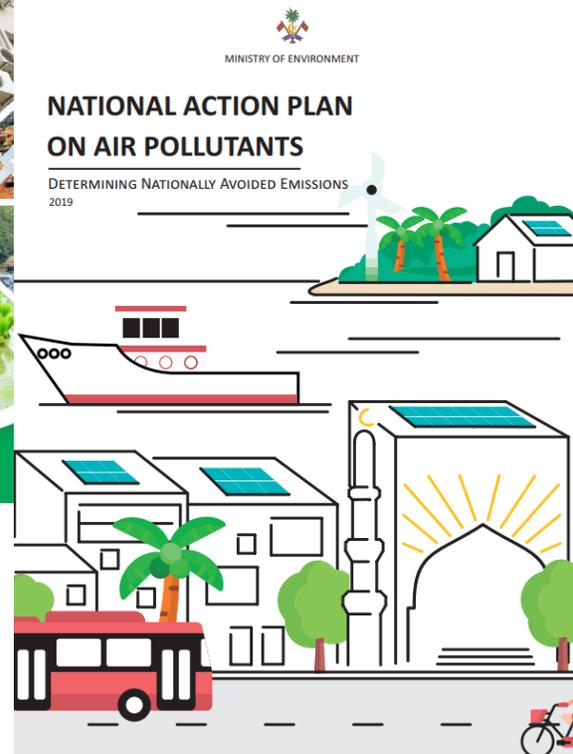
COALICIÓN
CLIMA Y
AIRE LIMPIO
PARA REDUCIR
CONTAMINANTES
DE VIDA CORTA



ONU
medio ambiente



NIGERIA'S NATIONAL ACTION PLAN (NAP)
TO REDUCE SHORT-LIVED
CLIMATE POLLUTANTS (SLCPs)



MINISTRY OF ENVIRONMENT

NATIONAL ACTION PLAN
ON AIR POLLUTANTS

DETERMINING NATIONALLY AVOIDED EMISSIONS
2019



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

LEAP-IBC: Calculation pathway



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

LEAP-IBC in Use: National Short-lived Climate Pollutant Action Planning in Ghana

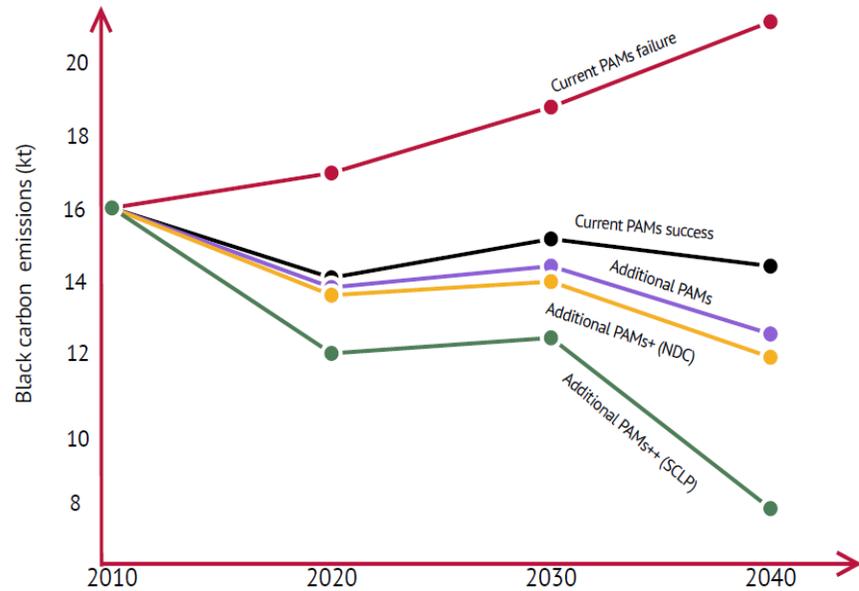


Fig 7 - Black carbon emission trajectories for five SLCP mitigation policy option

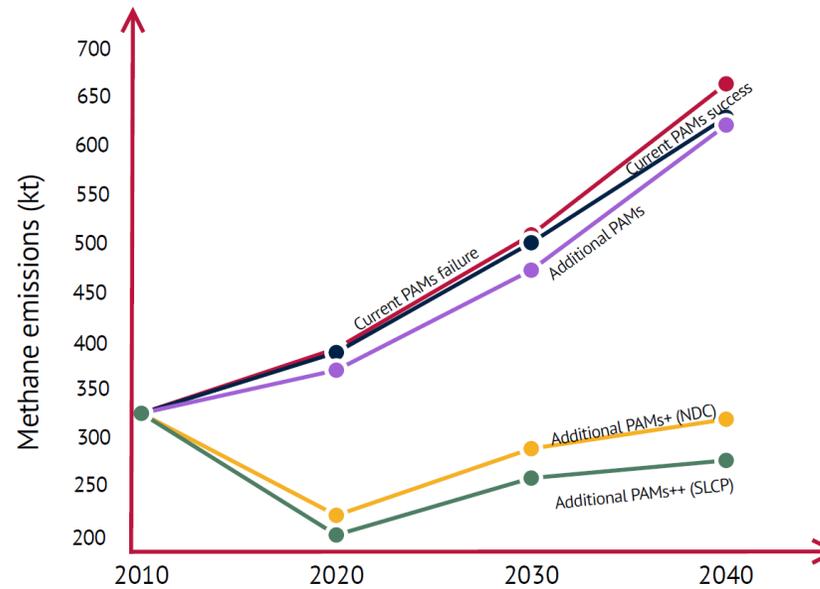
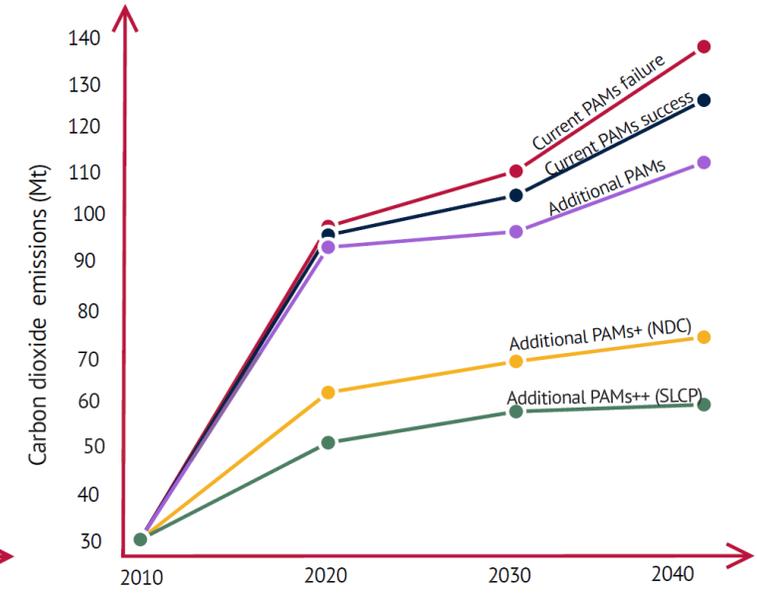
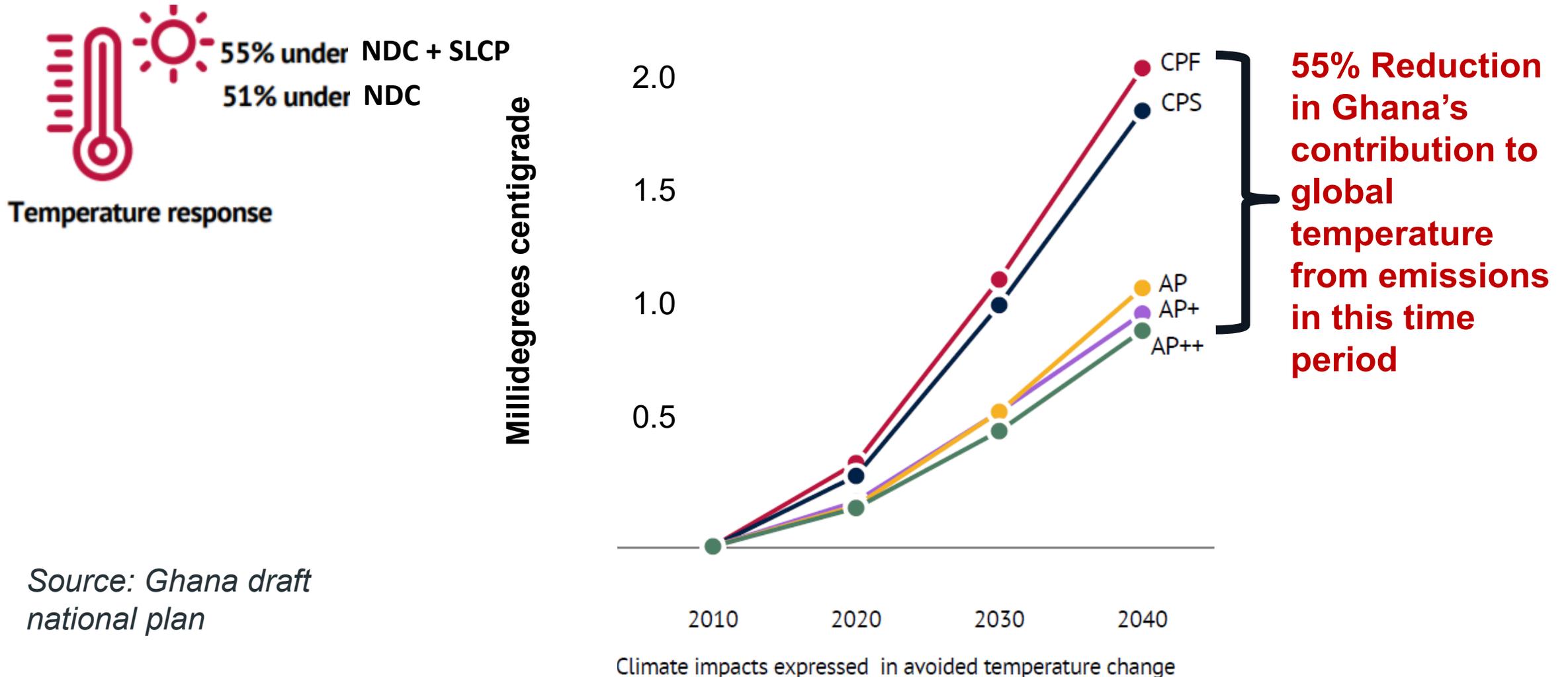


Fig 10 - Methane emission trajectories for five SLCP mitigation policy options



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Global Temperature Change from emissions from Ghana under different scenarios

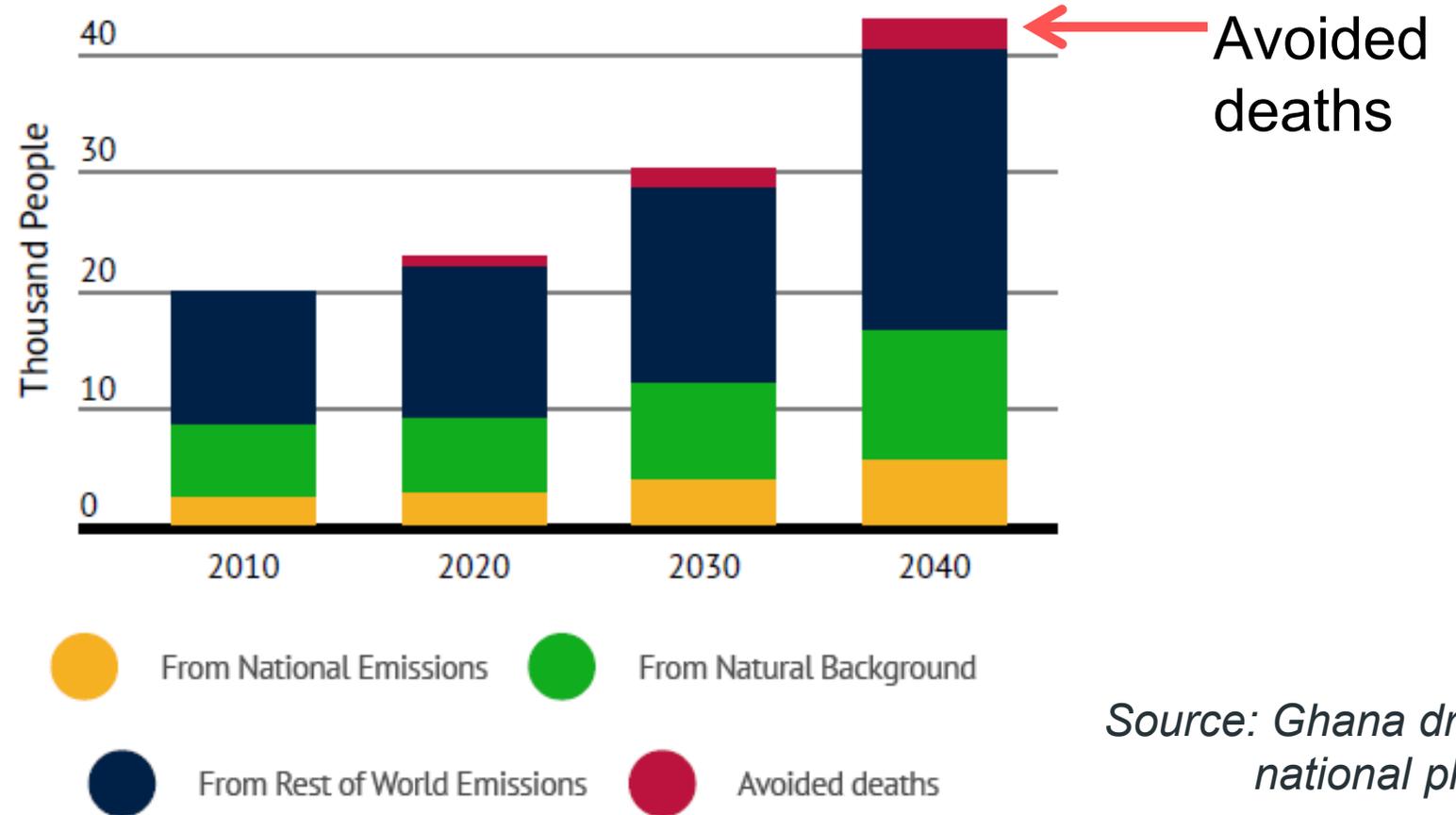


Source: Ghana draft national plan

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Premature mortality from emissions from Ghana under SLCP scenario – PAMS++

 2,560 under NDC + SLCP
 1,500 under NDC
Avoided deaths



Source: Ghana draft national plan

Fig 14 - Avoided deaths under Additional PAMs++

Policy development is enhanced by quantitative analyses

Ghana case study:

- 'It is difficult to motivate interest in CO₂ mitigation with decision makers in my country – we are insignificant and what we do will not make a difference'
- **Daniel Benefor – Ghana EPA** – *'having numbers on the size of the air pollution benefits of mitigation action can motivate action on CO₂ emissions as well – I can get a seat at the same table as the Ministry of Finance – it may be a long table, but I am there'*
- **Simpson Attieku – Ghana Energy Commission** – *'I love the IBC – now that I can quantify the premature deaths avoided by the soot free bus policy, the Ministry of Health has said maybe they should be involved – before that they saw it as an issue only for the transport ministry'*

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Who develops the data and models matters

- The analyses can be much more influential if the numbers come from practitioners in the country
- International numbers can be easily dismissed compared to officially accepted data
- Issues of data sensitivity c.f. Mexico where CO₂ emission figures from the modelling need to mirror official estimates, if the SLCP / air quality analyses are to be taken up by government
- National analysts are in the best position to understand gaps and tailor the analysis accordingly – c.f Chile and reducing BC from off-road machinery



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

The analysis needs to be embedded within broader policy development process

- Local model developers can tailor the analysis to policy and political context, and available data
- Quantitative process must go hand in hand with other planning processes
- Stakeholder engagement throughout process is important – sensitising people to the process of developing the modelling – c.f. Nigeria SLCP planning
- Goals can be related to policy context and policy needs – especially if being developed by government



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Strengthening link between air quality and climate change planning creates coherent policies and can enhance ambition

- Coherent policy development can be enhanced by integrated analyses
- Linking the AQ and climate planning can be cost-effective
- Sustainability of modelling effort can be enhanced

Ghana's
Second
Biennial
Update
Report



To the United Nations Framework Convention on Climate Change

3.4.2 Trends of Short-Lived Climate Pollutants

Short-Lived Climate Pollutants are powerful greenhouse gases and local air pollutants and are emitted through similar economic activities as the GHGs. Tackling SLCPs emissions has both global climate and local air quality benefits. Therefore, Ghana has reported on an inventory of GHG and non-GHG SLCP covering CH₄, BC and HFC for the period 1990-2016. Figure 5 is a chart showing the trend of direct SLCP for 1990-2016.

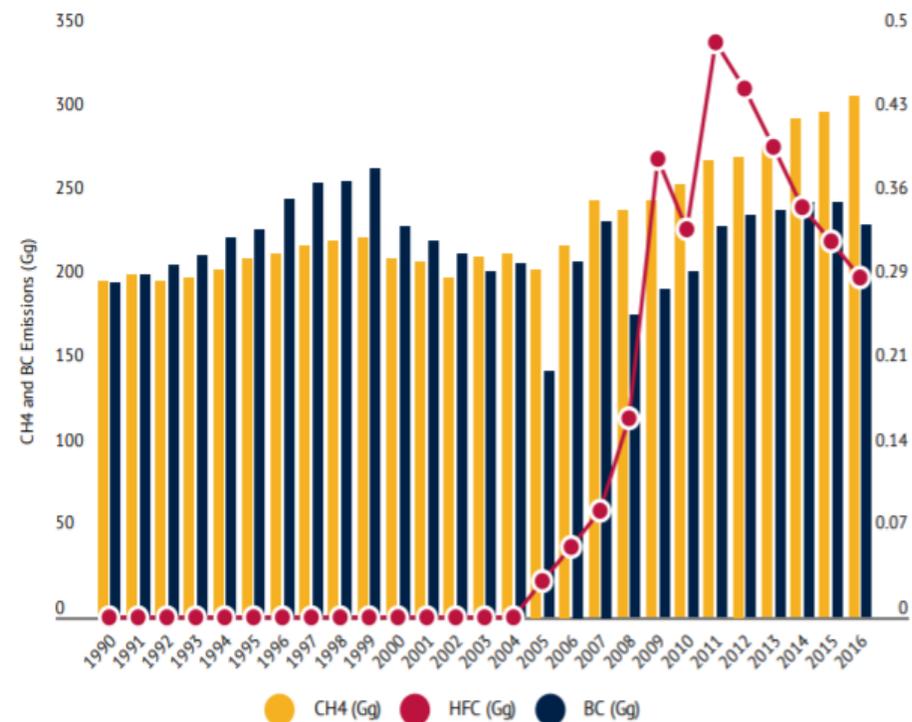


Figure 5: A chart showing SLCPs emission trends for the period 1990-2016

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Ghana National SLCP Action Plan: integrated analysis highlights AQ benefits of climate policy and climate benefits of SLCP strategy

15 measures

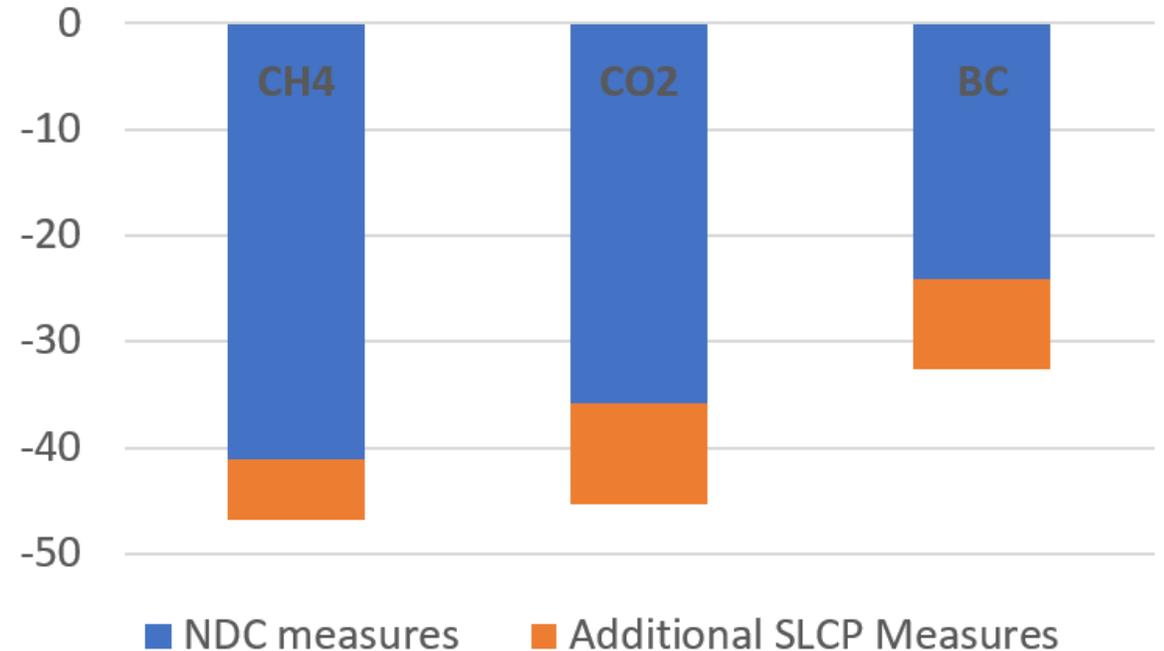
in transport, waste, agriculture, power generation, industry and residential sectors

Includes:

11 NDC measures

4 measures to increase ambition

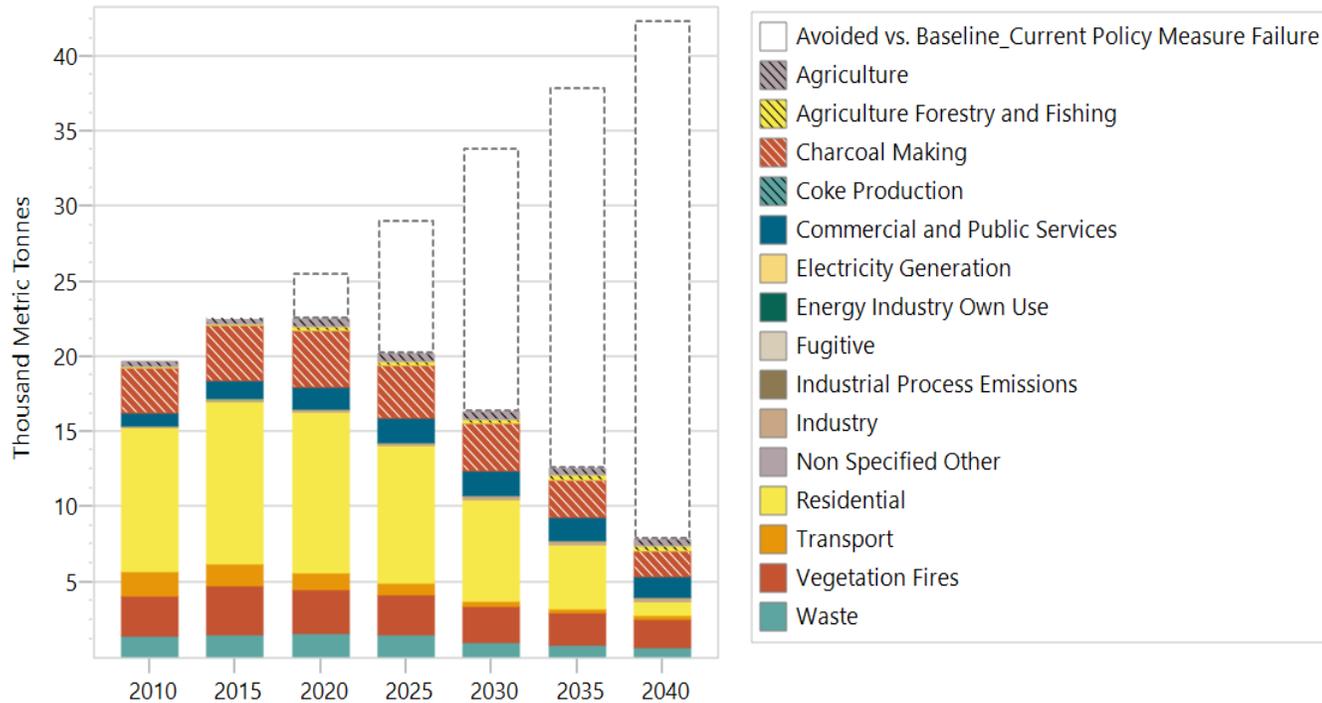
SLCPs integrated in climate reporting (2nd BUR, 4th National Communication, National GHG Inventory Report)



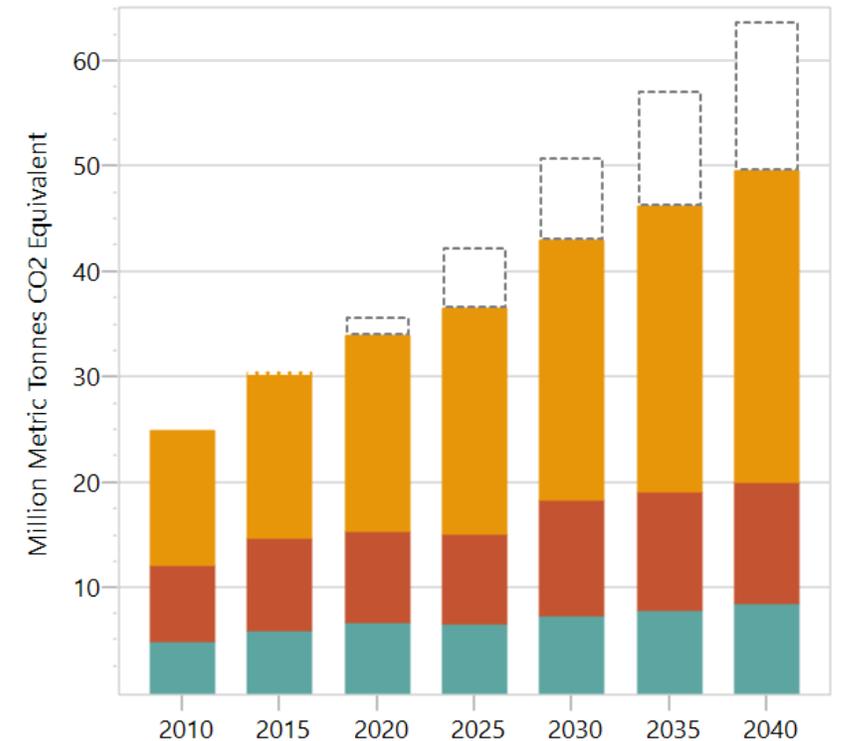
This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Cote d'Ivoire identifies specific mitigation measures to reduce SLCPs, improve air quality and achieve 50% of GHG target

Black Carbon emissions: All measures scenario



GHG emissions: All measures scenario

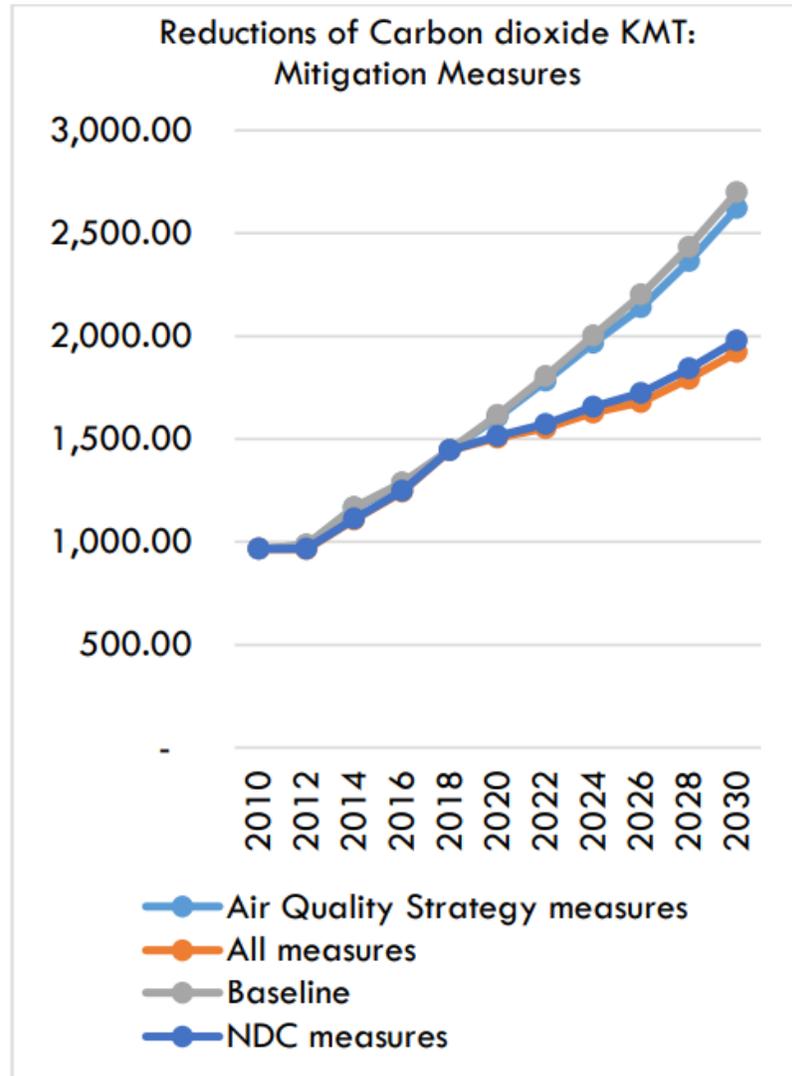
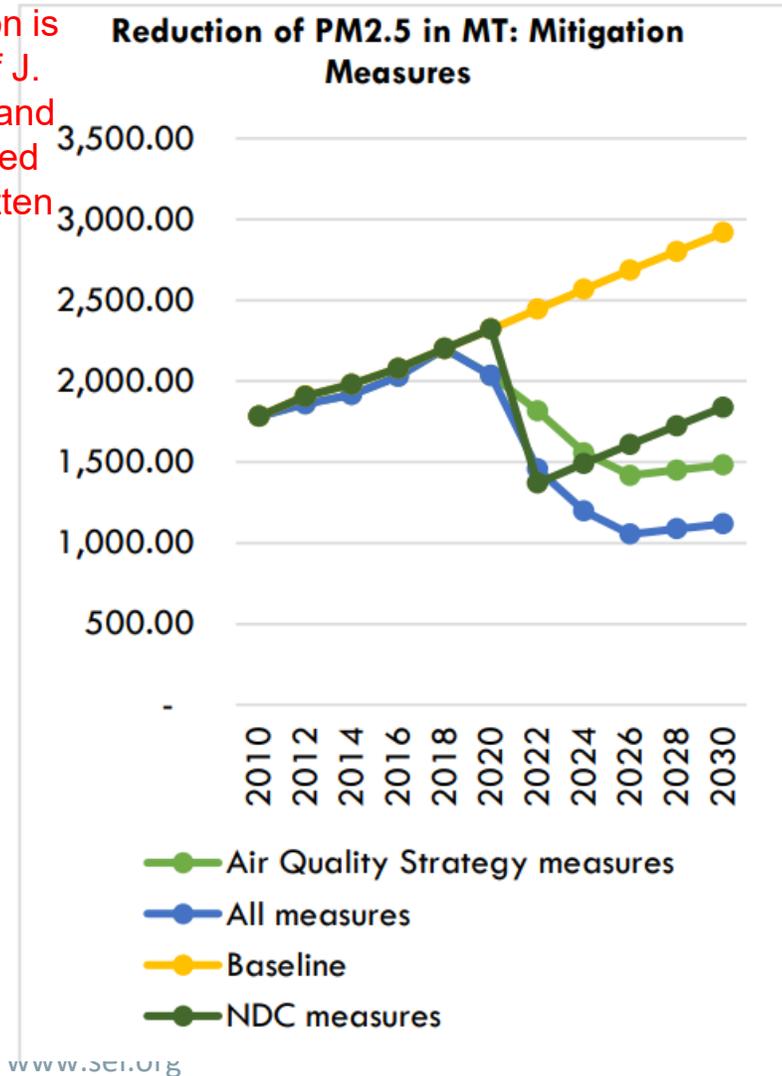


The main point here is that the planning process and modelling allowed Cote d'Ivoire to develop specificity as to how the target could be achieved



The Maldives achieves 35% reduction in PM_{2.5} emissions from achieving climate mitigation commitment, and additional CO₂ mitigation from air quality strategy (not doing any further harm)

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Capacity needs to be built to undertake analyses in national institutions

Capacity is needed to be able to address all the linked issues:

- Understand the science
- Understand the measures to address emissions
- Understand the different strategies that can implement measures
- Develop the policy process
- Be able to use tools to develop integrated national models that can inform the planning processes



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Air Pollution and climate change action plan in Togo – an LDC



République togolaise

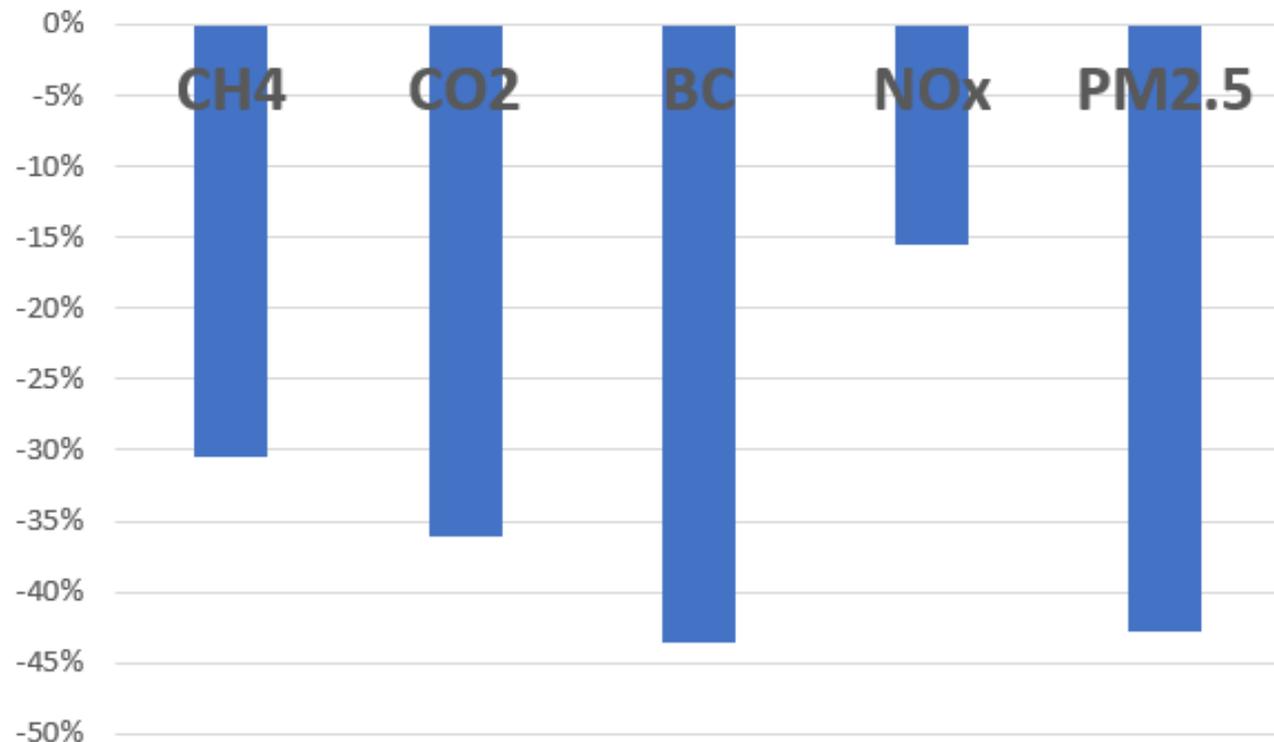


Plan national de réduction des polluants atmosphériques et climatiques de courte durée de vie du Togo

2019-2024



14 measures: 11 NDC measures and 3 further measures
Integrated plan achieving SLCP, GHG and air pollution reductions



Practical and flexible tools need to support national planning

There are key components of tools that can support integrated planning:

- Availability of relevant tools they can use and own and make training and support available to support the process (c.f. CCAC)
- Tools need to be user-friendly
- Tools need to be supported
- Need to be relevant – reporting on indicators people care about
- Flexible – so that they can be tailored to national circumstances
- Expandable (link to SDG planning)
- Can be used for communication (c.f. Ghana planning meeting)
- There is a need to make these tools more relevant for development planning

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Thank you





E. Overview of Priority Mitigation Measures

	<i>Source Sector</i>		SLCP Abatement Measures
1	<i>Transport</i>	1	<i>Phasing out of high emitting vehicles</i>
		2	<i>Promotion of (CNG) Buses/Taxis</i>
		3	<i>Diesel and Petrol Low Sulphur Policy</i>
		4	<i>Euro III Emission Standard</i>
		5	<i>Euro IV Emission Standard</i>
		6	<i>Transport Modal Shifts</i>
2	<i>Residential</i>	7	<i>LPG for Cooking</i>
		8	<i>Improved Cookstoves</i>
		9	<i>Policy Low Sulphur (Kerosene)</i>
3	<i>Oil & Gas</i>	10	<i>Flare-Out</i>
		11	<i>Fugitive emissions/leakages Control</i>
		12	<i>Methane Leakage Reduction</i>
4	<i>Industry</i>	13	<i>Efficient brick kilns</i>
5	<i>Waste Management</i>	14	<i>Waste Separation</i>
		15	<i>Landfill Methane Gas Recovery</i>
		16	<i>Septic Sludge Collection</i>
		17	<i>Sewerage Systems and Municipal Wastewater Treatment Plants</i>
6	<i>Agriculture</i>	18	<i>Intermittent Aeration (AWD)</i>
		19	<i>Stop open-field burning of Agriculture Waste.</i>
		20	<i>Anaerobic Digestion (AD)</i>
7	<i>Power [Energy]</i>	21	<i>Expansion of National Electricity Coverage</i>
		22	<i>Solar Generators for Electricity</i>
8	<i>HFCs</i>	23	<i>HFC Consumption Reduction.</i>



Information is the courtesy of J. Kuylenstierna and shall not be used without his written permission. **NIGERIA**



Substantial SLCP emission reductions from SLCP measures

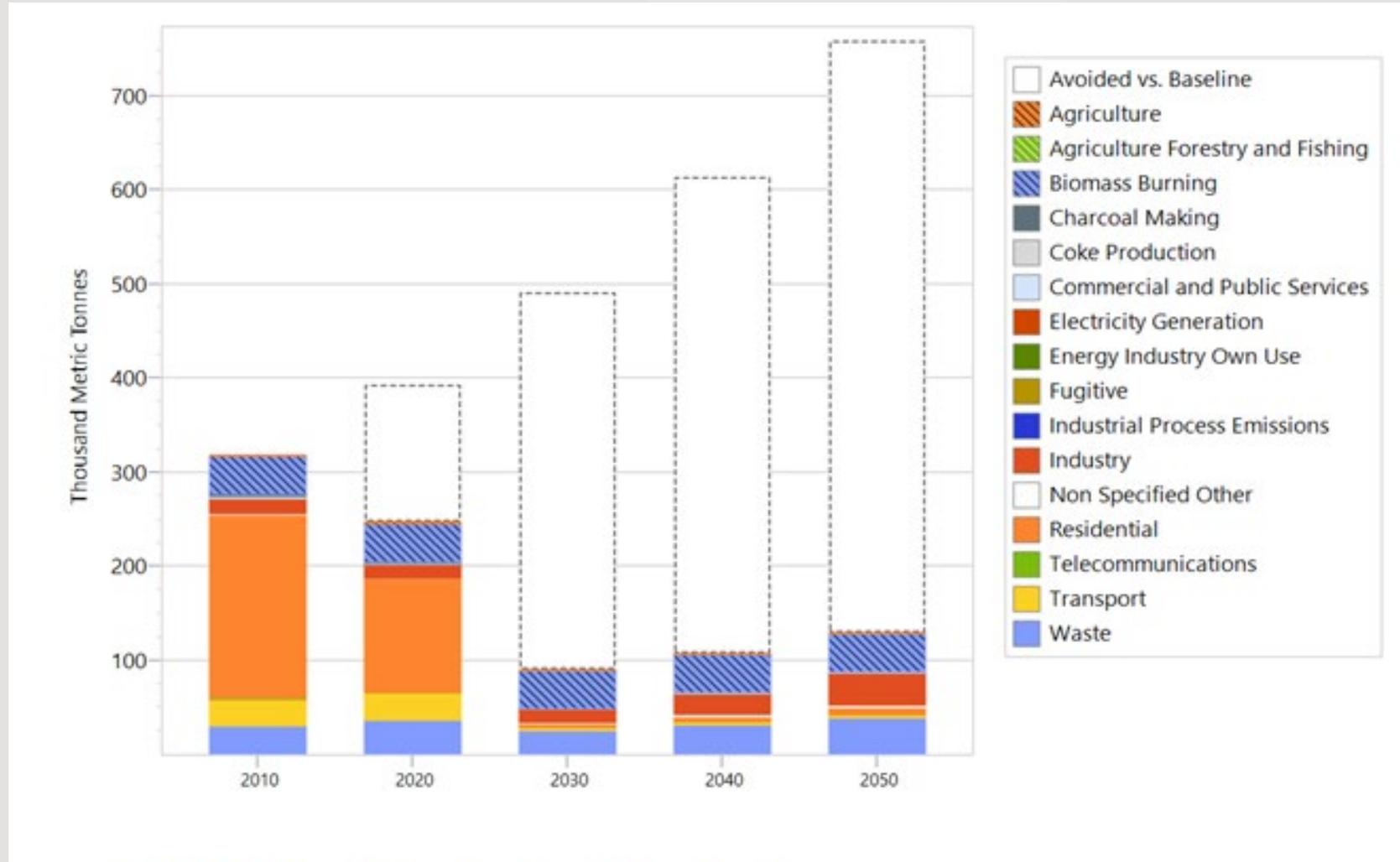


Fig 3.1: Black Carbon Emission Savings.



Information is the courtesy of J. Kuylenstierna and shall not be used without his written permission. **NIGERIA**



Substantial SLCP emission reductions from SLCP measures

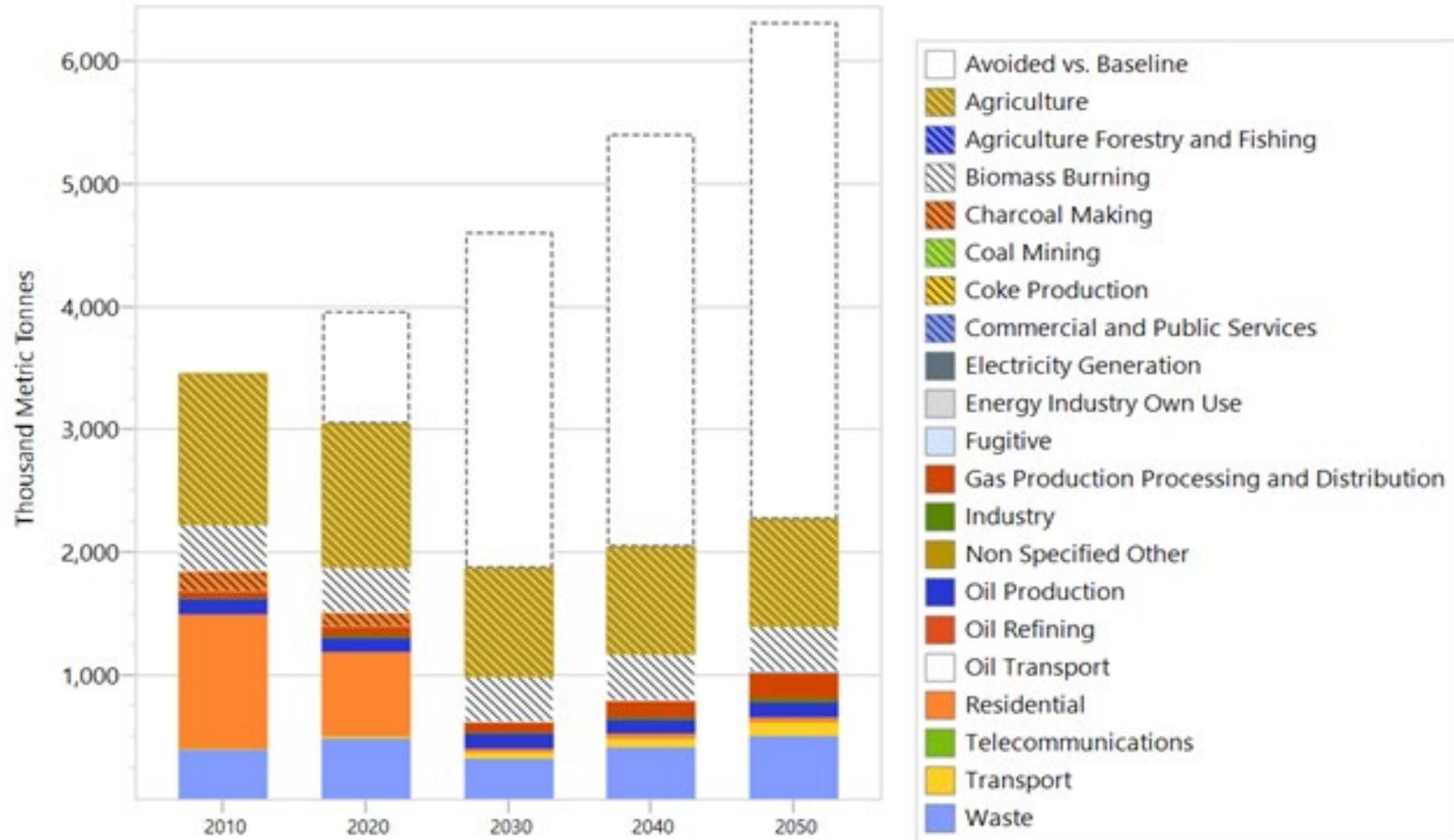


Fig 3.2: Methane Emission Savings



Information is the courtesy of J. Kuylenstierna and shall not be used without his written permission. **NIGERIA**



Multiple benefits: GHG emission reduction from SLCP measures

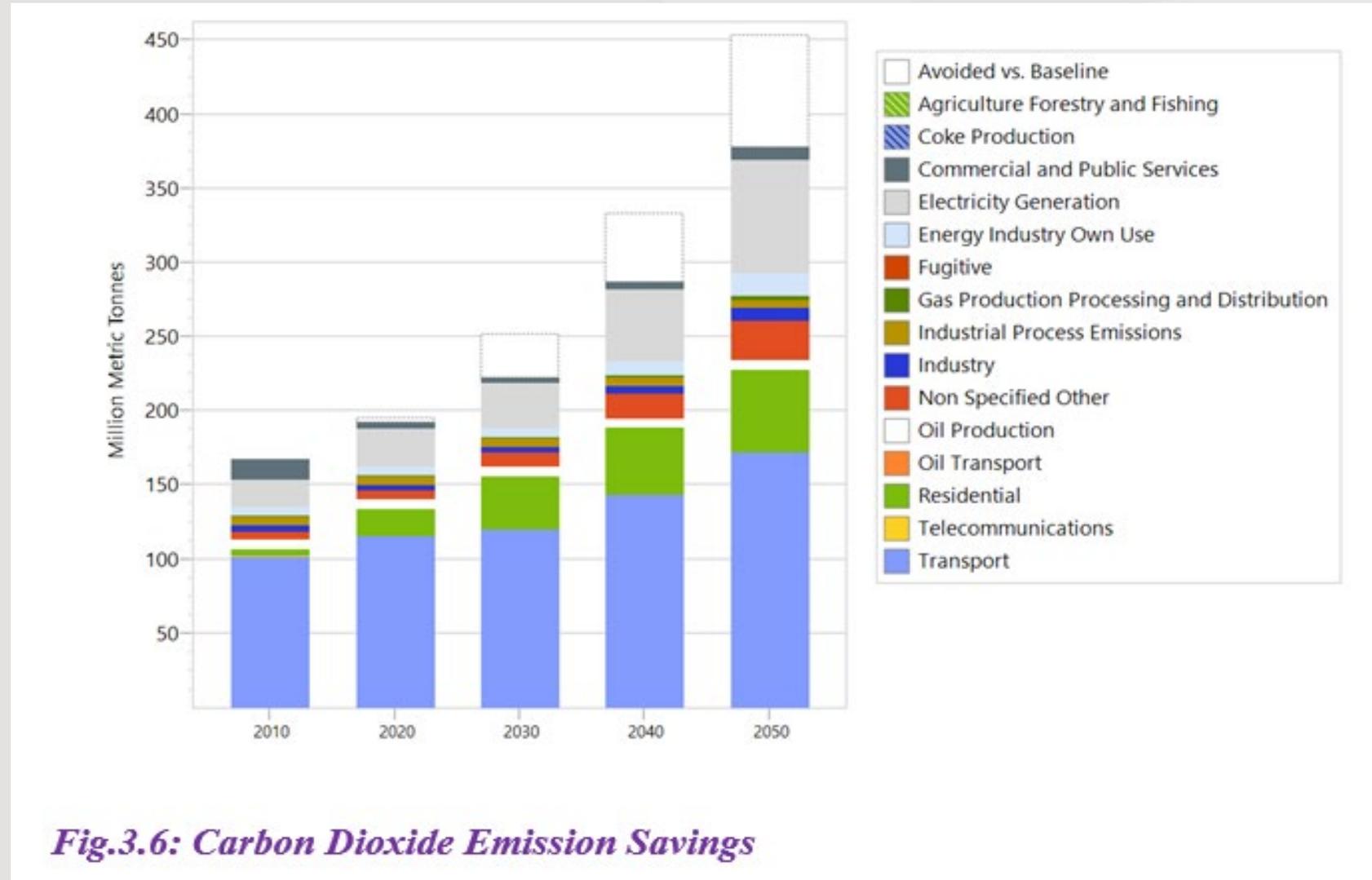


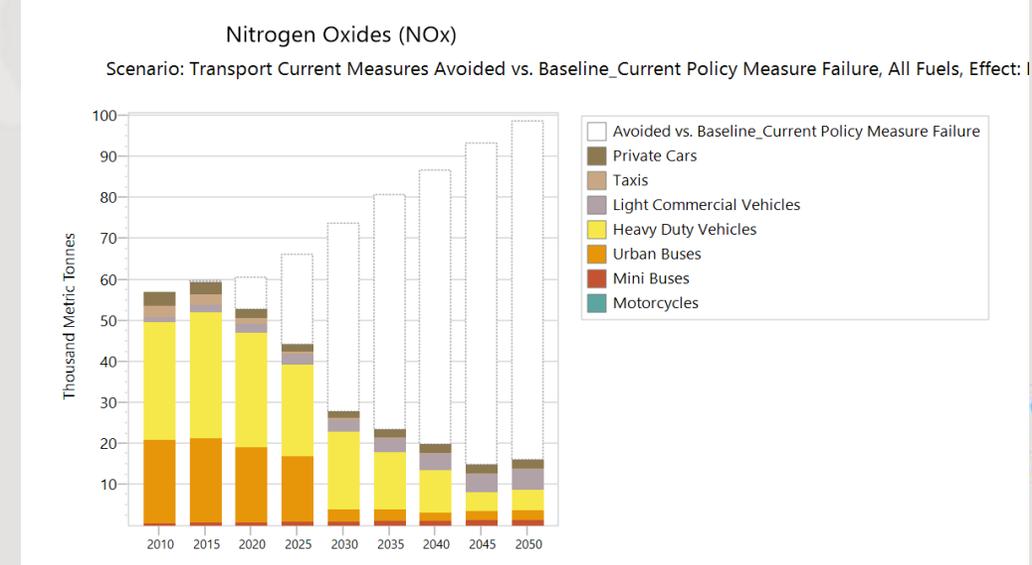
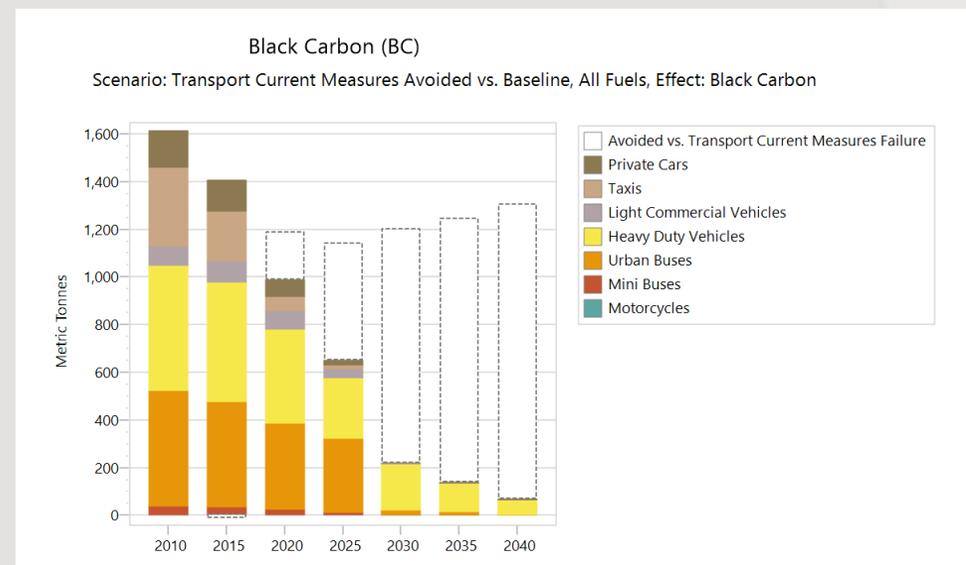
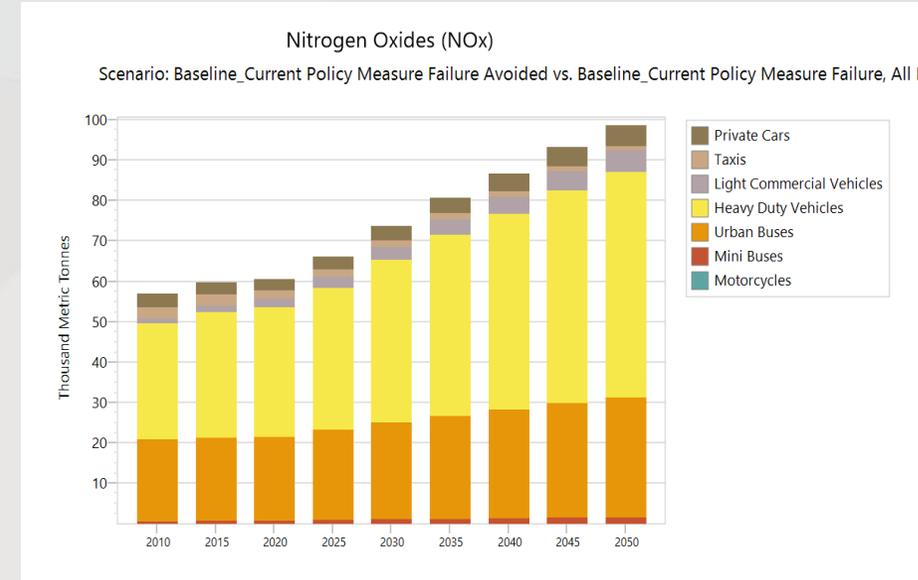
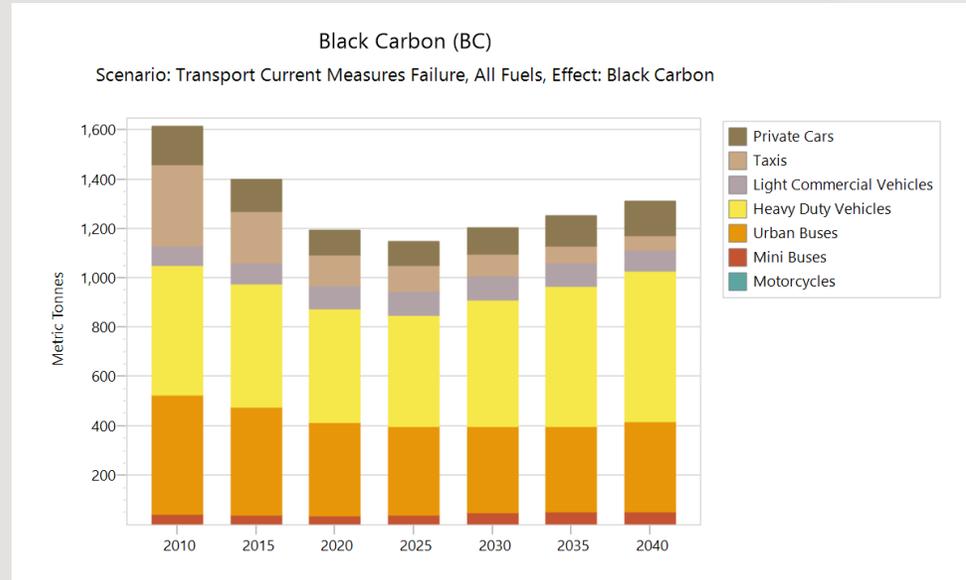
Fig.3.6: Carbon Dioxide Emission Savings



Mesures d'atténuation des SLCP en Côte d'Ivoire

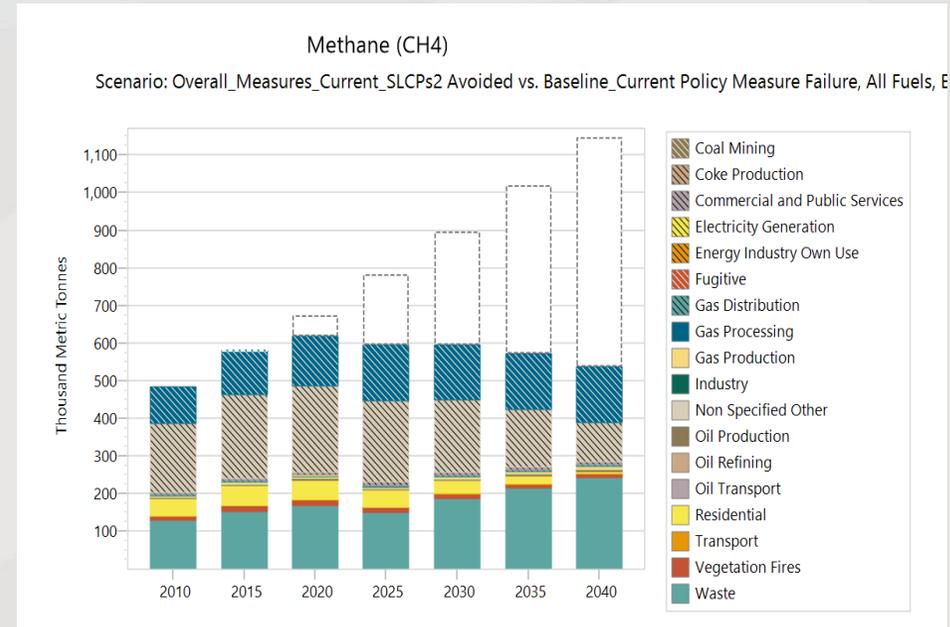
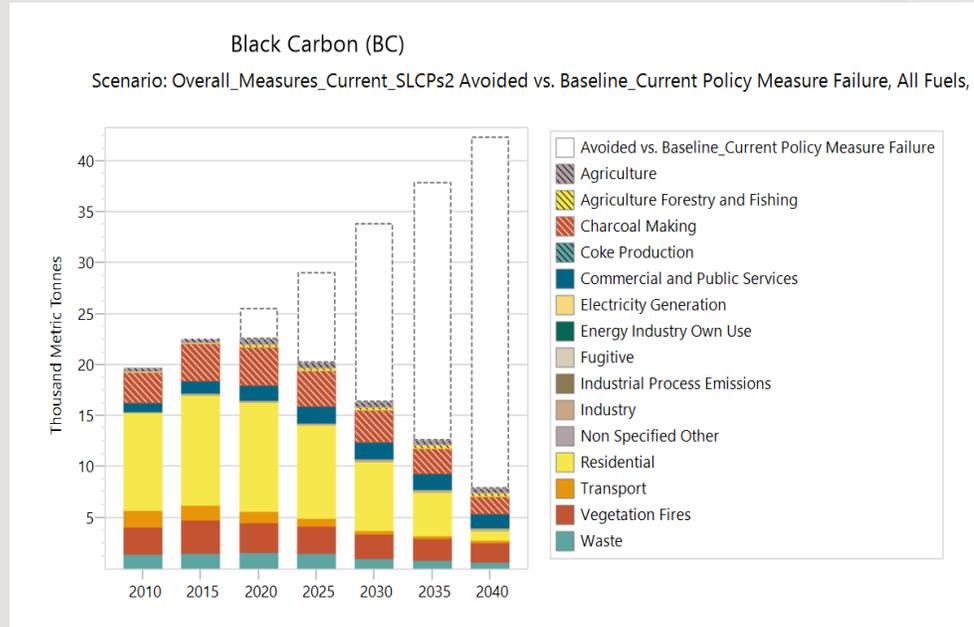
Resultats de l'analyse détaillée du secteur Transport

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.



Scénario d'atténuation global du SLCP par rapport au scénario de référence pour la Côte d'Ivoire

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

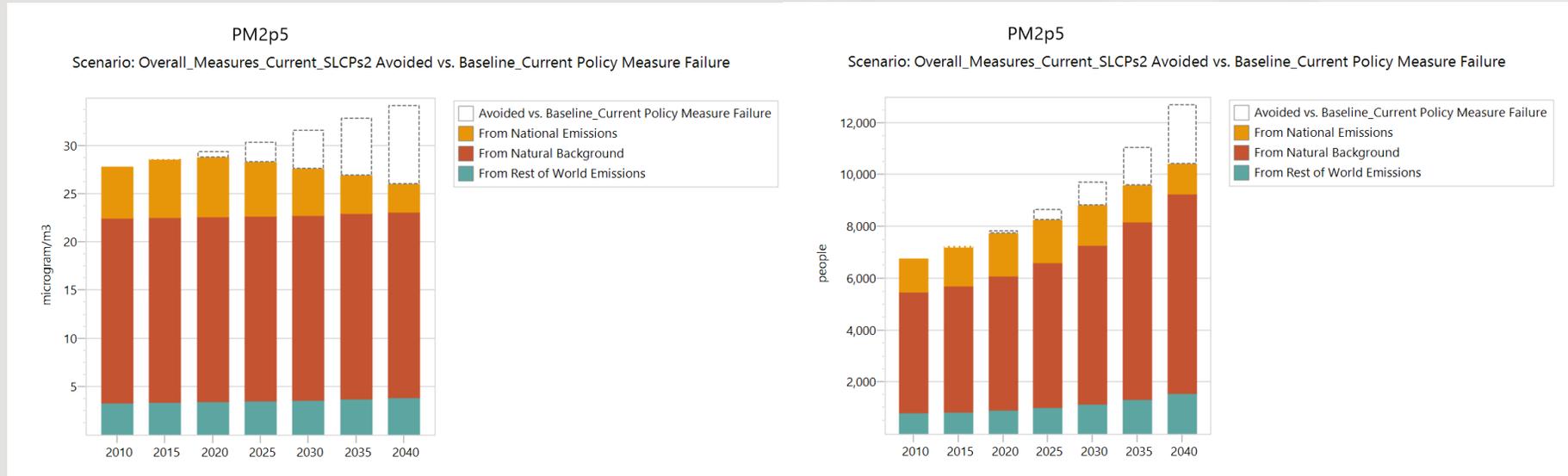


- Jusqu'à 52% de réduction des émissions de carbone noir d'ici 2030 et plus de 80% d'ici 2040
- Jusqu'à 34% de réduction des émissions de méthane (CH₄) d'ici 2030 et plus de 50% d'ici 2040



Benefices multiples de la réduction des SLCP en Côte d'Ivoire

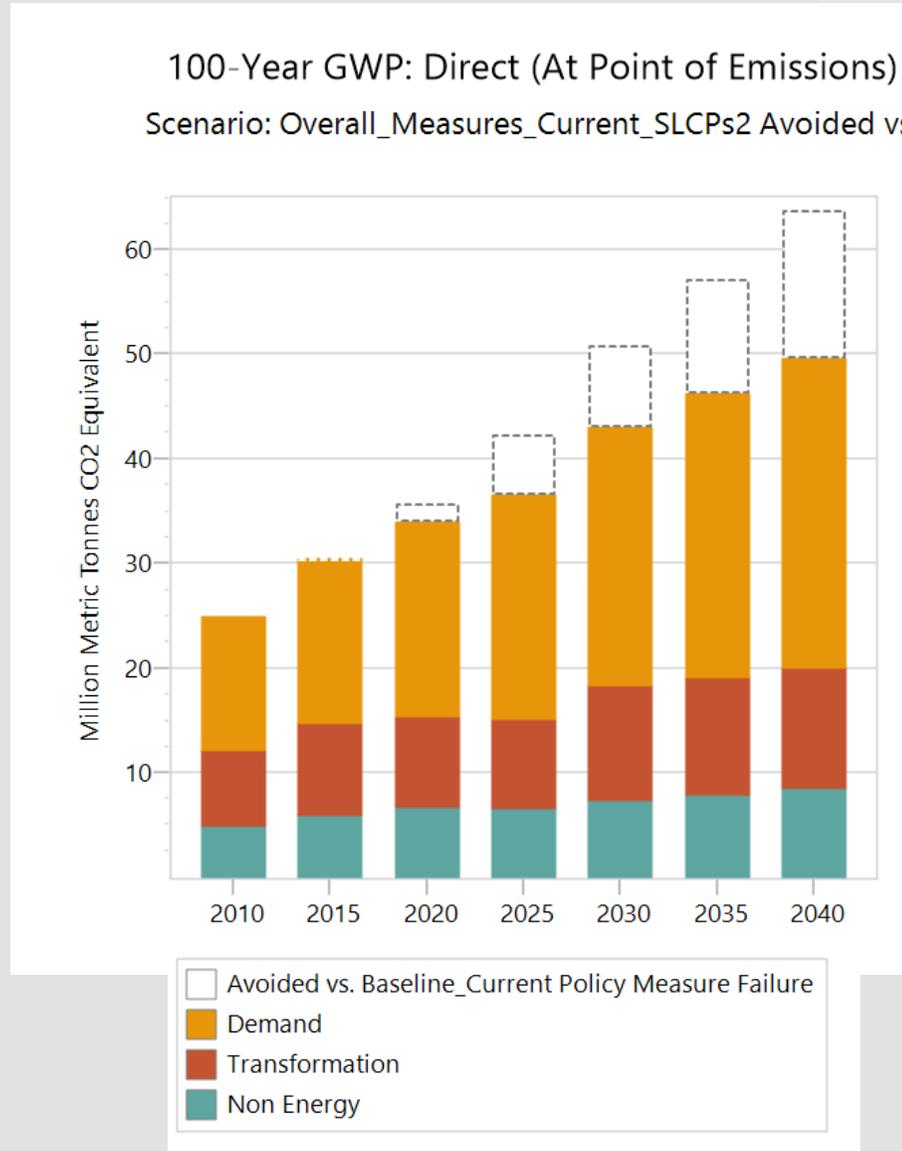
This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.



- Jusqu'à 45% de réduction de la concentration de PM 2,5 par les émissions nationales d'ici 2030 et de 74% d'ici 2040
- Jusqu'à 10% (1 000 personnes) de décès prématurés associés à une exposition aux PM2,5 d'ici 2030 et plus de 18% (2 300 personnes) d'ici 2040



Approche trajectoire pour le renforcement des CDN



- Le plan national du SLCP fournit une base pour l'analyse de trajectoires pour le renforcement des CDN en Côte d'Ivoire;
- Identifie les politiques, les mesures et leurs effets sur les émissions et autres avantages connexes (réduction de 16% des GES d'ici 2030);
- Nécessité de prendre en compte tous les gaz et polluants



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Emissions from mitigation scenarios



Atmospheric transport & concentrations



To climate



To health

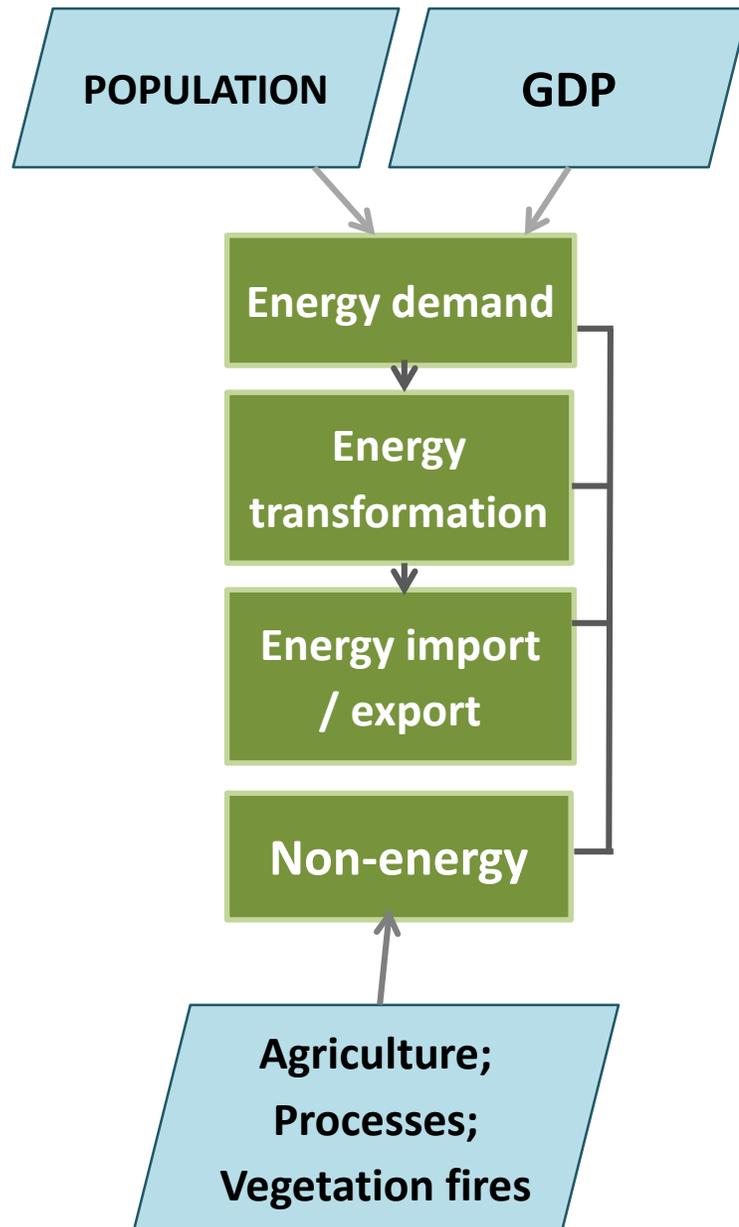


To crops

The 'Long-range Energy Planning System with Integrated Benefits Calculator'

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

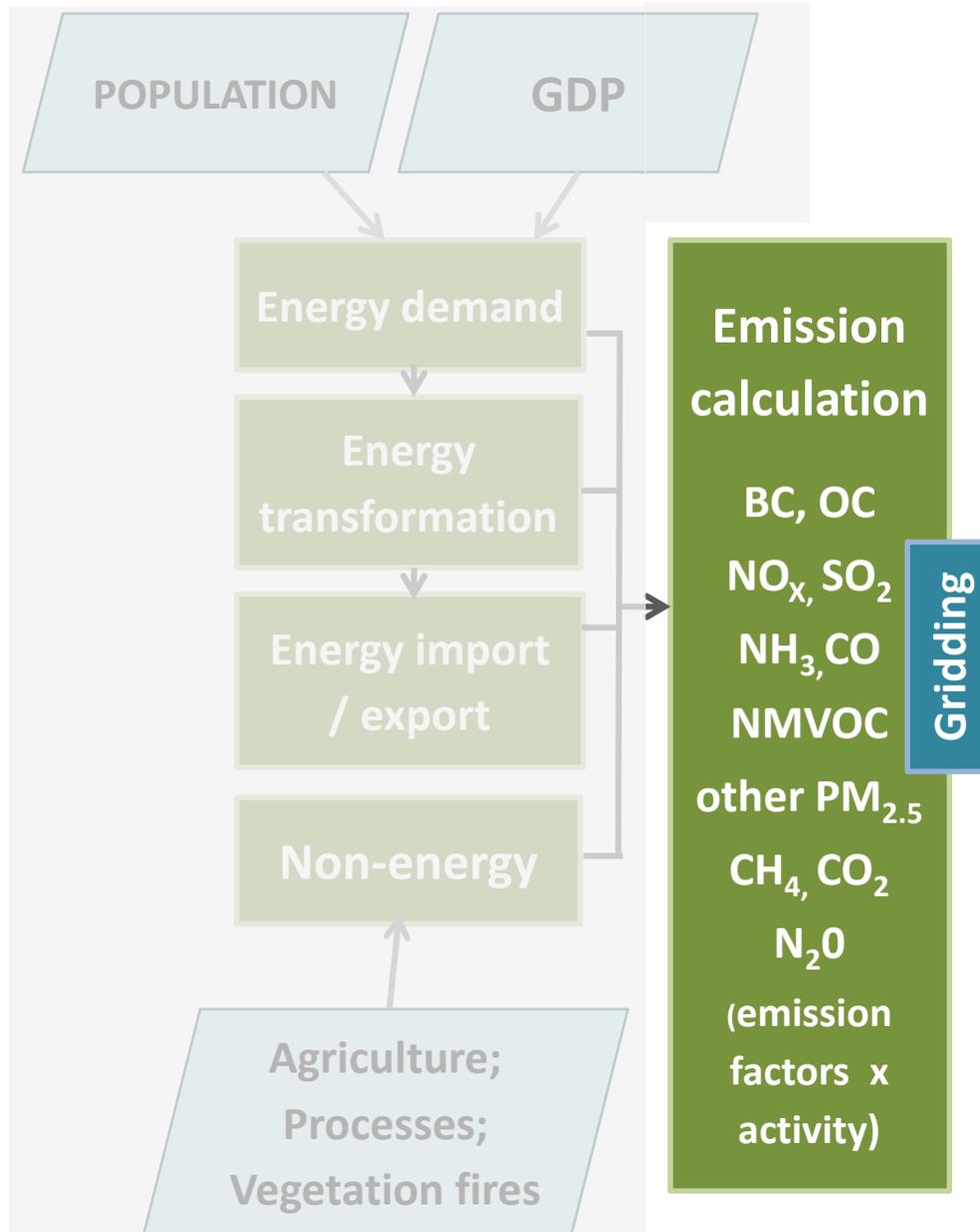
LEAP-IBC structure and steps in analysis



STEP 1: COLLECT DATA FOR ENERGY AND NON-ENERGY SOURCES

- Activity data by sector
- Population and GDP data for building scenarios

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.



STEP 2: CALCULATE EMISSIONS

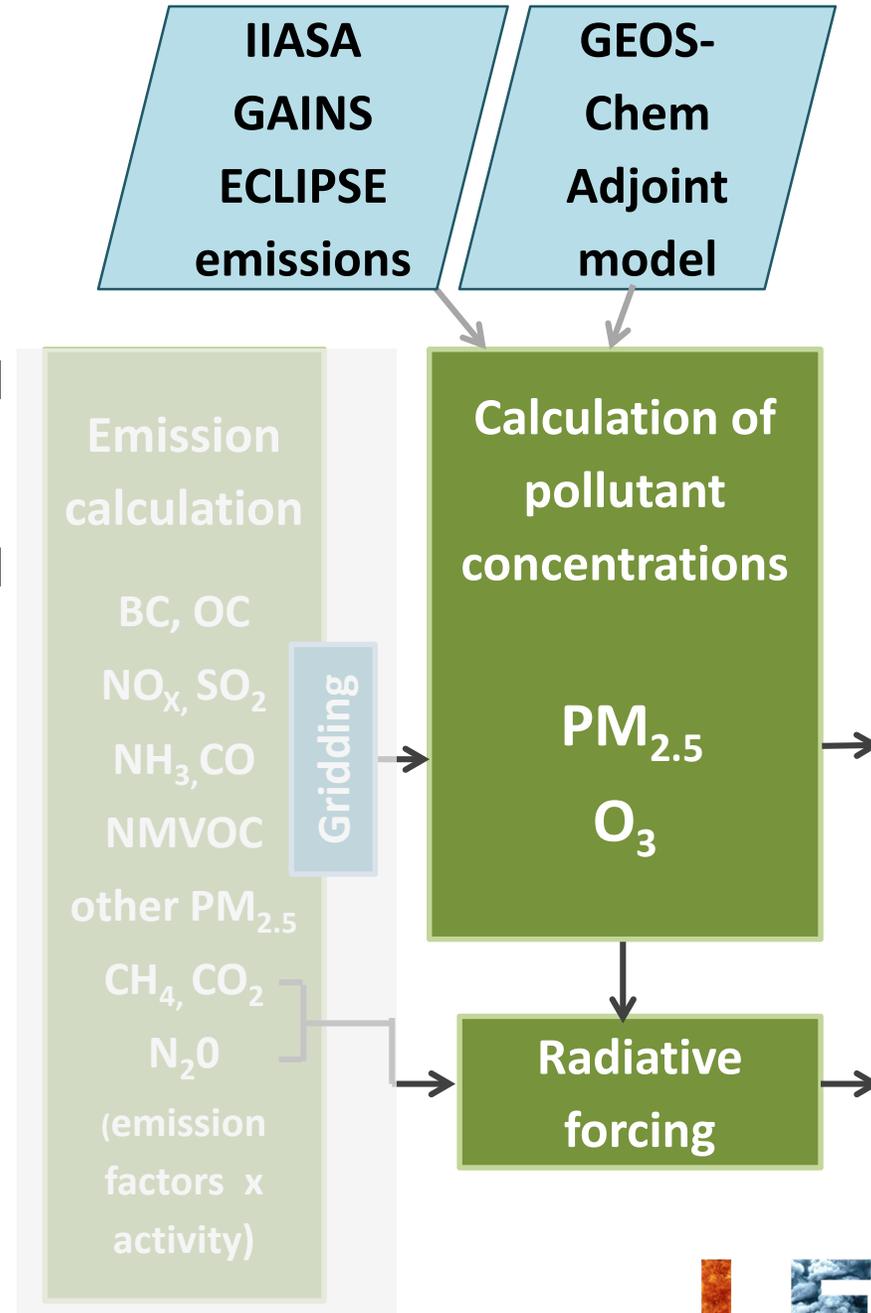
- Default emissions factors or based on local data
- Tier 1, 2 or 3 methods established by IPCC and EMEP-EEA used

STEP 3: CREATE EMISSIONS SCENARIOS

- Development in each sector related to drivers (GDP, population etc.)

STEP 4: LEAP-IBC AUTOMATICALLY CALCULATES:

- Population-weighted mean $PM_{2.5}$
- Population-weighted ozone
- Crop location/yield weighted ozone



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

STEP 5: LEAP-IBC AUTOMATICALLY CALCULATES:

Health Impacts

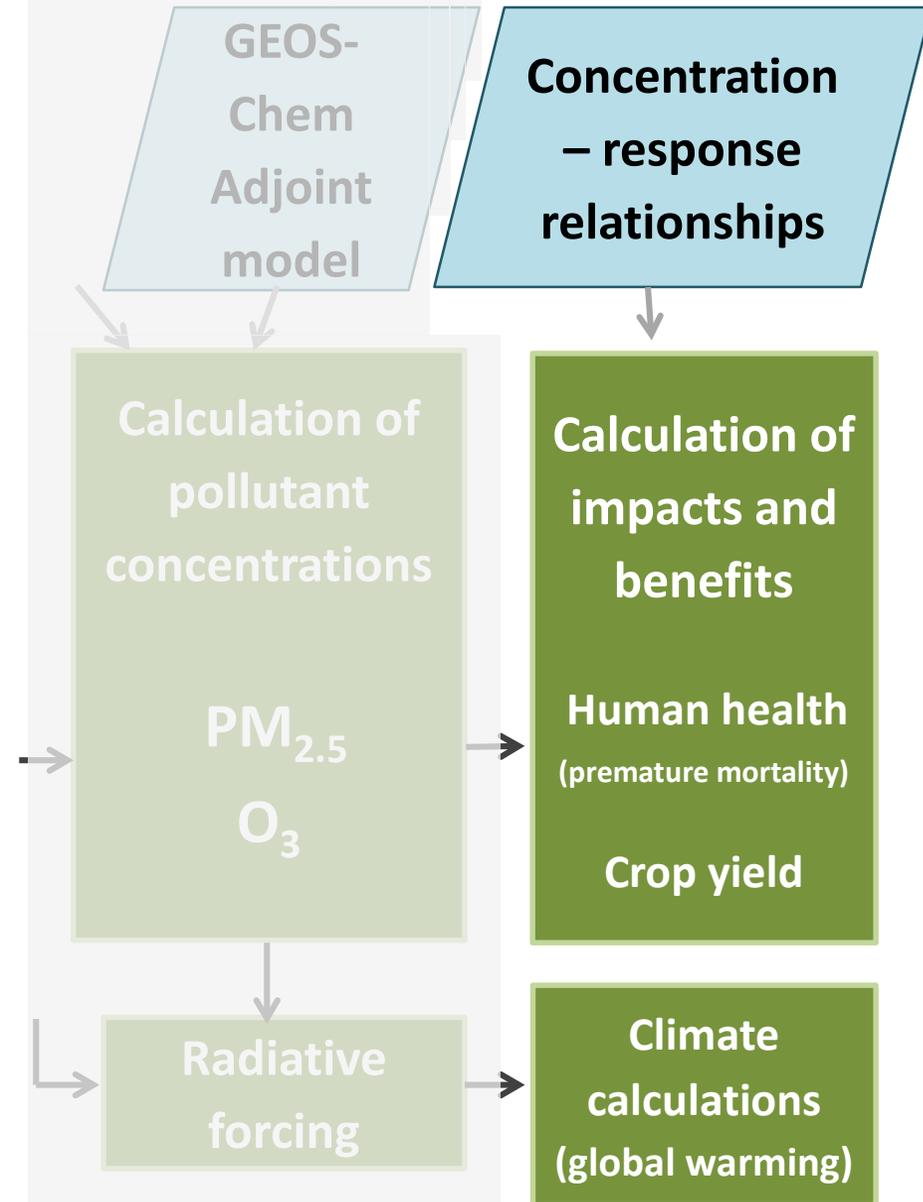
- PM_{2.5}-related deaths from strokes, heart disease, lung cancer & respiratory diseases
- ozone deaths from respiratory disease
- Using WHO / GBD recommended approaches

Crop Impacts

- Rice, wheat, soybean, maize yield reductions due to ozone

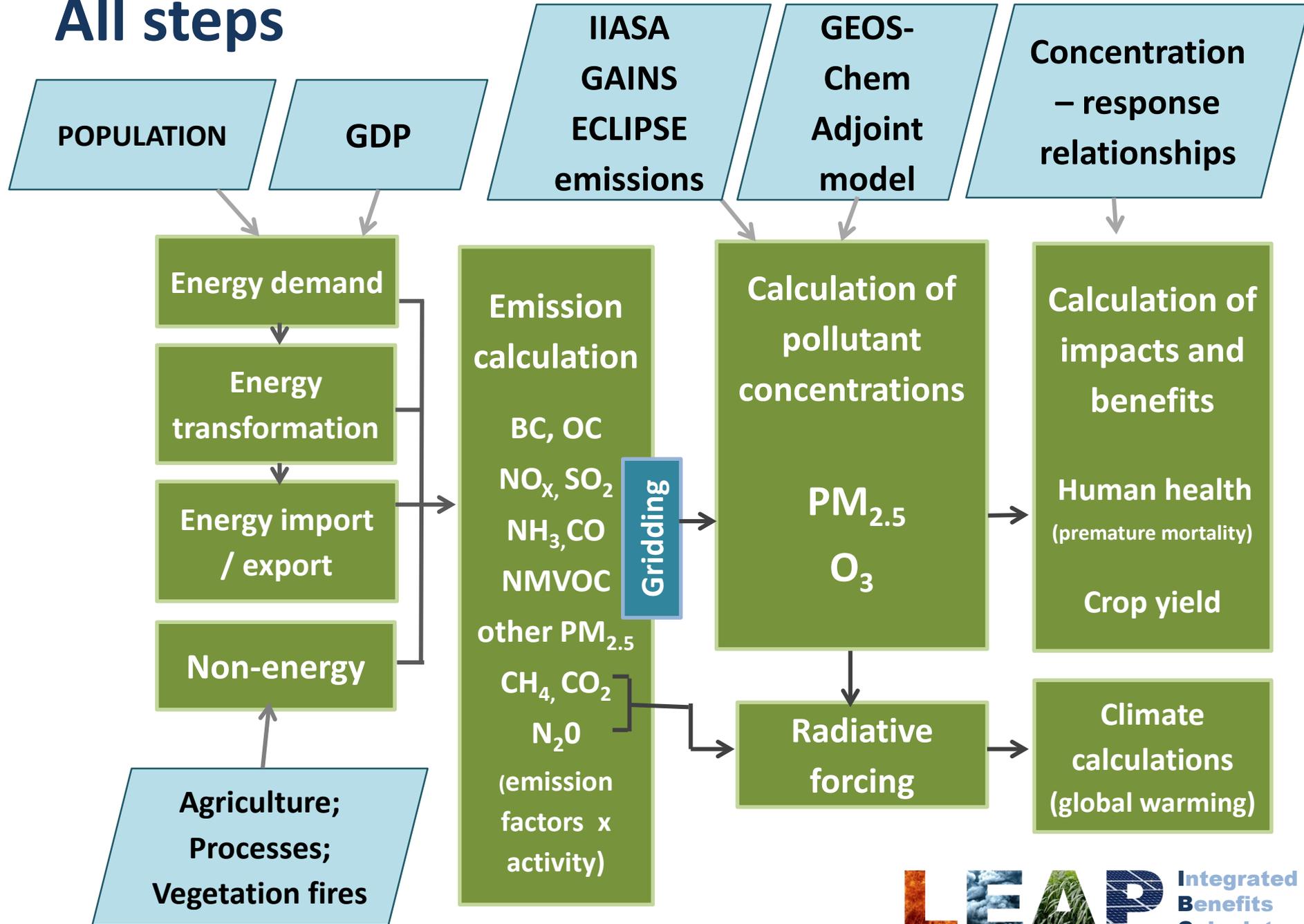
Climate Impacts

- Radiative forcing from GHG emissions, and for BC, NO_x, SO₂, NMVOCs, OC
- This radiative forcing is turned into change in temperature using standard methods (AGTP)



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

All steps



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Health benefits

SLCPs affect human health – cause premature deaths

By indoor air pollution 3.5 million deaths annually

By outdoor particulate pollution 3.2 million annually

Energy benefits

Energy efficiency and access

Better combustion; Methane recovery; Recovery of Waste to Energy.

Agriculture benefits

Ecosystems – FOOD SECURITY

Loss of crop yields from ground level ozone

Climate benefits

Near-term global and regional CLIMATE CHANGE

The global warming temperature in the near term could be halved by reducing SLCPs



Further development of LEAP-IBC



- LEAP-IBC continues to be developed
- We are adding cost data for measures, further health impacts, valuing impacts and improving functionality
- An urban application of LEAP-IBC is being developed in Accra and Nairobi
- We are also always improving the user interface and supporting material, and training courses.
- We are also including methods for uncertainty estimation



SEE <https://www.energycommunity.org/> FOR DETAILS

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

LEAP

Integrated Benefits Calculator

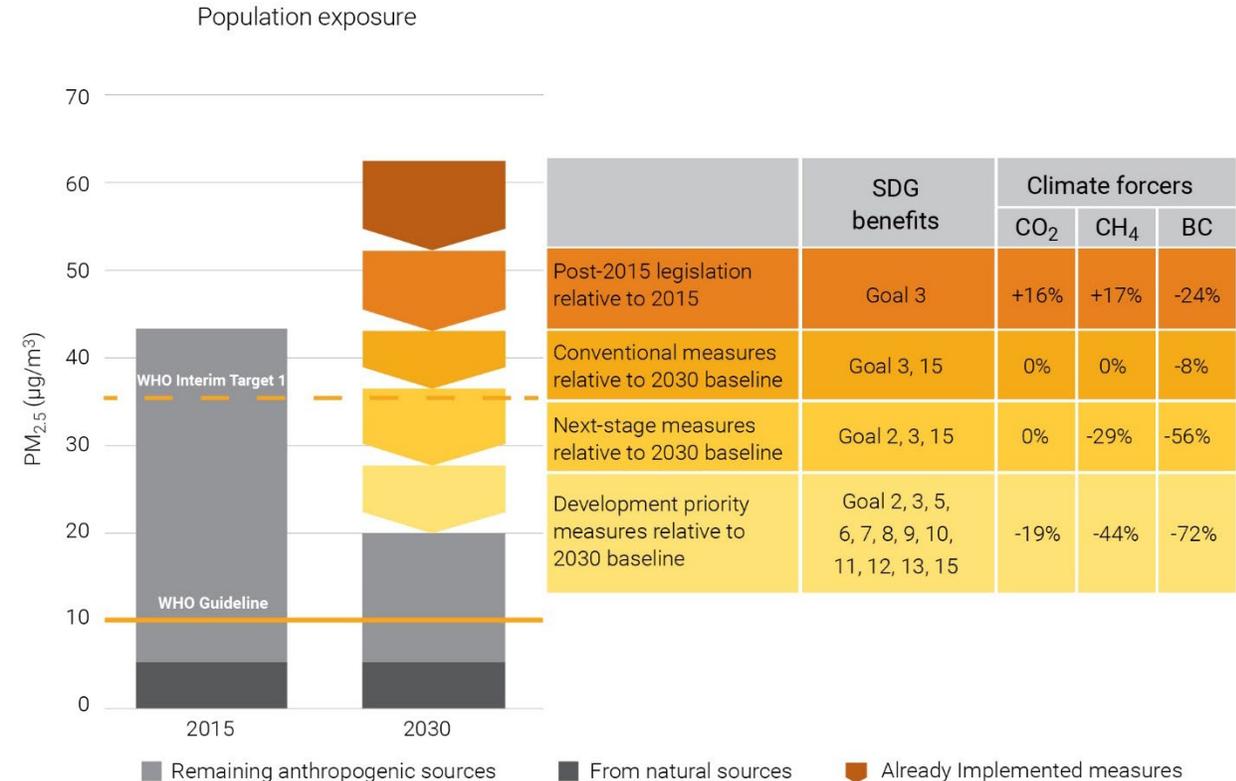
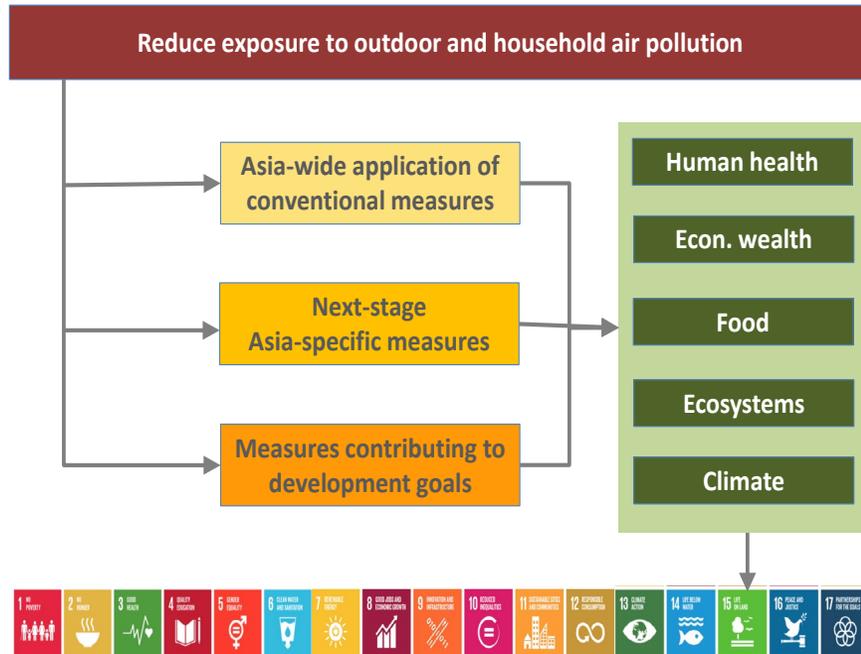
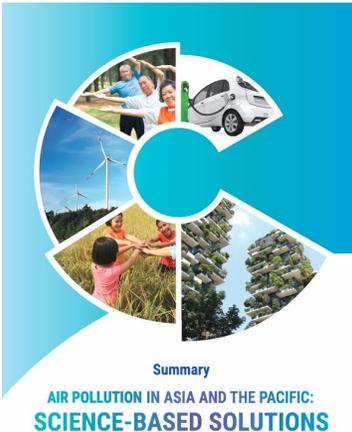
*A tool for integrated
climate change and
air pollution
planning*

Johan Kuylenstierna
SEI Research Leader

Chris Malley
SEI Researcher

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Opportunity from integrated air pollution and climate change mitigation



25 top 'Clean Air' measures bring air pollution below WHO guideline for 1 billion people and reduce global temperature increase by 0.3

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Full application of conventional measures to all countries in Asia

Post-combustion controls

Introduce state-of-the-art end-of-pipe measures to reduce sulphur dioxide, nitrogen oxides and particulate emissions at power stations and in large-scale industry

Industrial process emissions standards

Introduce advanced emissions standards in industries, e.g., iron and steel plants, cement factories, glass production, chemical industry, etc.

Emissions standards for road vehicles

Strengthen all emissions standards; special focus on regulation of light- and heavy-duty diesel vehicles

Vehicle inspection and maintenance

Enforce mandatory checks and repairs for vehicles

Dust control

Suppress construction and road dust; increase green areas

Next-stage air quality measures [*on dispersed sources*]

Agricultural crop residues

Manage agricultural residues, including strict enforcement of bans on open burning

Residential waste burning

Strictly enforce bans on open burning of household waste

Prevention of forest and peatland fires

Prevent forest and peatland fires through improved forest, land and water management and fire prevention strategies

Livestock manure management

Introduce covered storage and efficient application of manures; encourage anaerobic digestion

Nitrogen fertilizer application

Establish efficient application; for urea also use urease inhibitors and/or substitute with, for example, ammonium nitrate

Brick kilns

Improve efficiency and introduce emissions standards

International shipping

Require low-sulphur fuels and control of particulate emissions

Solvent use and refineries

Introduce low-solvent paints for industrial and do-it-yourself applications; leak detection; incineration and recovery

Measures contributing to priority goals for development [energy, agriculture, urban planning] with benefits for air quality [including methane-related measures] + HFC measures

Clean cooking and heating

Use clean fuels – electricity, natural gas, liquefied petroleum gas (LPG) in cities, and LPG and advanced biomass cooking and heating stoves in rural areas; substitution of coal by briquettes

Renewables for power generation

Use incentives to foster extended use of wind, solar and hydro power for electricity generation and phase out the least efficient plants

Energy efficiency for households

Use incentives to improve the energy efficiency of household appliances, buildings, lighting, heating and cooling; encourage roof-top solar installations

Energy efficiency standards for industry

Introduce ambitious energy efficiency standards for industry

Electric vehicles

Promote the use of electric vehicles

Improved public transport

Encourage a shift from private passenger vehicles to public transport

Solid waste management

Encourage centralized waste collection with source separation and treatment, including gas utilization

Rice paddies

Encourage intermittent aeration of continuously flooded paddies

Wastewater treatment

Introduce well-managed two-stage treatment with biogas recovery

Coal mining

Encourage pre-mining recovery of coal mine gas

Oil and gas production

Encourage recovery of associated petroleum gas; stop routine flaring; improve leakage control

(HFC) refrigerant replacement

Ensure full compliance with the Kigali Amendment

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

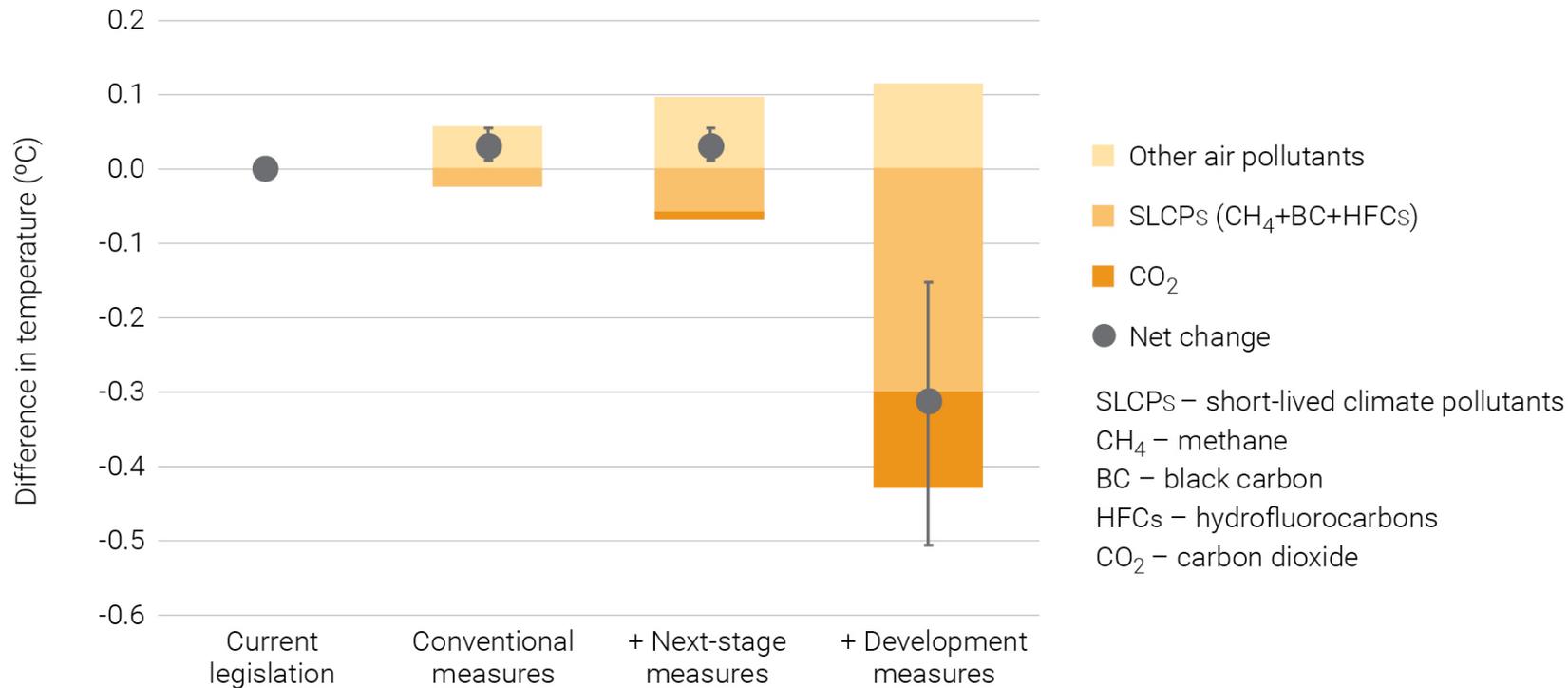
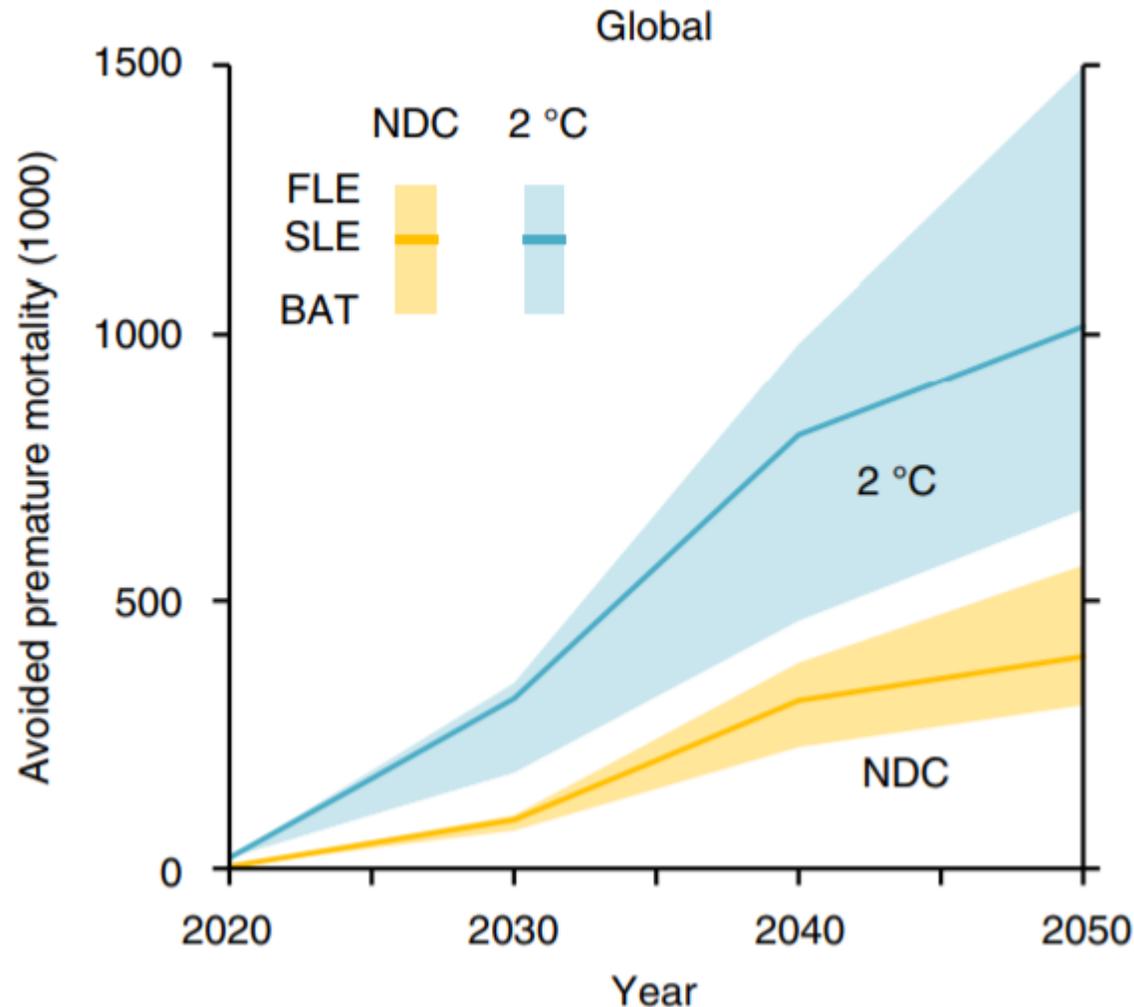


FIGURE 2.11: CHANGES IN GLOBAL MEAN TEMPERATURE FROM THE THREE PORTFOLIOS OF MEASURES, IN 2050 RELATIVE TO THE 2030 BASELINE PROJECTION

The Top 25
clean air
measures
could
avoid
0.3°C of
warming
by 2050

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Substantial opportunity from integrated air pollution and climate change mitigation



Air pollution health benefits of climate mitigation: Over 1 million premature deaths avoided in 2050 if Paris target is achieved

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

LEAP-IBC: Calculation pathway



This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

LEAP-Integrated Benefits Calculator

- **LEAP-IBC:** Scenario modelling tool allowing practitioners in country to quantify air quality and climate change benefits of different plans, strategies and measures
- **Data Requirements:** Designed for iterative improvements in analysis as data improves, and adapted to national circumstances
- **Inputs:** Demographic and macroeconomic data and projections, Energy balances, GHG inventories, Climate, air quality, energy, sectoral plans and policies, Costs
- **Outputs:** Energy demand and supply, Pollutant emissions – direct and indirect, Social costs, **Impacts of air pollution and GHG emissions on health and climate**



- **Build Capacity for integrated planning:** Designed for use by planners in countries
- **Evaluate benefits of mitigation measures:** Identify and model specific measures to achieve targets, and provide quantitative information on local benefits of action
- **Enhance Communication:** Increase collaboration between institutions involved in climate change, air pollution, energy planning, and increase linkage to other Stakeholders (e.g. sectoral ministries, Ministry of Health)

This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

LEAP-IBC in use - the Ghana SLCP plan: Measures included in mitigation policy

Table 3: List of selected SCLP mitigation measures

Sector	SLCP abatement measures	Rank	SLCP policy package	Measure outlook
Energy	LPG for cooking (LPGC)	High	Additional PAMs	Low hanging fruits
Energy	Solar systems (SS)	High	Additional PAMs	
Forest	Reduced forest burning (RFB)	Low	Additional PAMs+	NDC measures
Waste & energy	Institutional Biogas (IB)	Low	Additional PAMs+	
Transport	Promote CNG Buses (CNG)	High	Additional PAMs+	
Waste	Stop open-burning (SOB)	Medium	Additional PAMs+	
Waste	Landfill gas management (LFM)	High	Additional PAMs+	
Energy	Improved cookstoves (ICS)	High	Additional PAMs+	
Energy	Natural Gas for electricity (NGE)	High	Additional PAMs+	
Energy	Eco-friendly electricity (EFE)	Medium	Additional PAMs+	
Energy & forest	Efficient charcoal kilns (ECK)	High	Additional PAMs+	
Agriculture	Quality livestock feeding (QLF)	Low	Additional PAMs++	
Transport	Vehicle testing standards (VTS)	Medium	Additional PAMs++	
Energy	Cutting-edge stoves (CES)	Medium	Additional PAMs++	
Industry	Gas in plastic industry (GPI)	Low	Additional PAMs++	

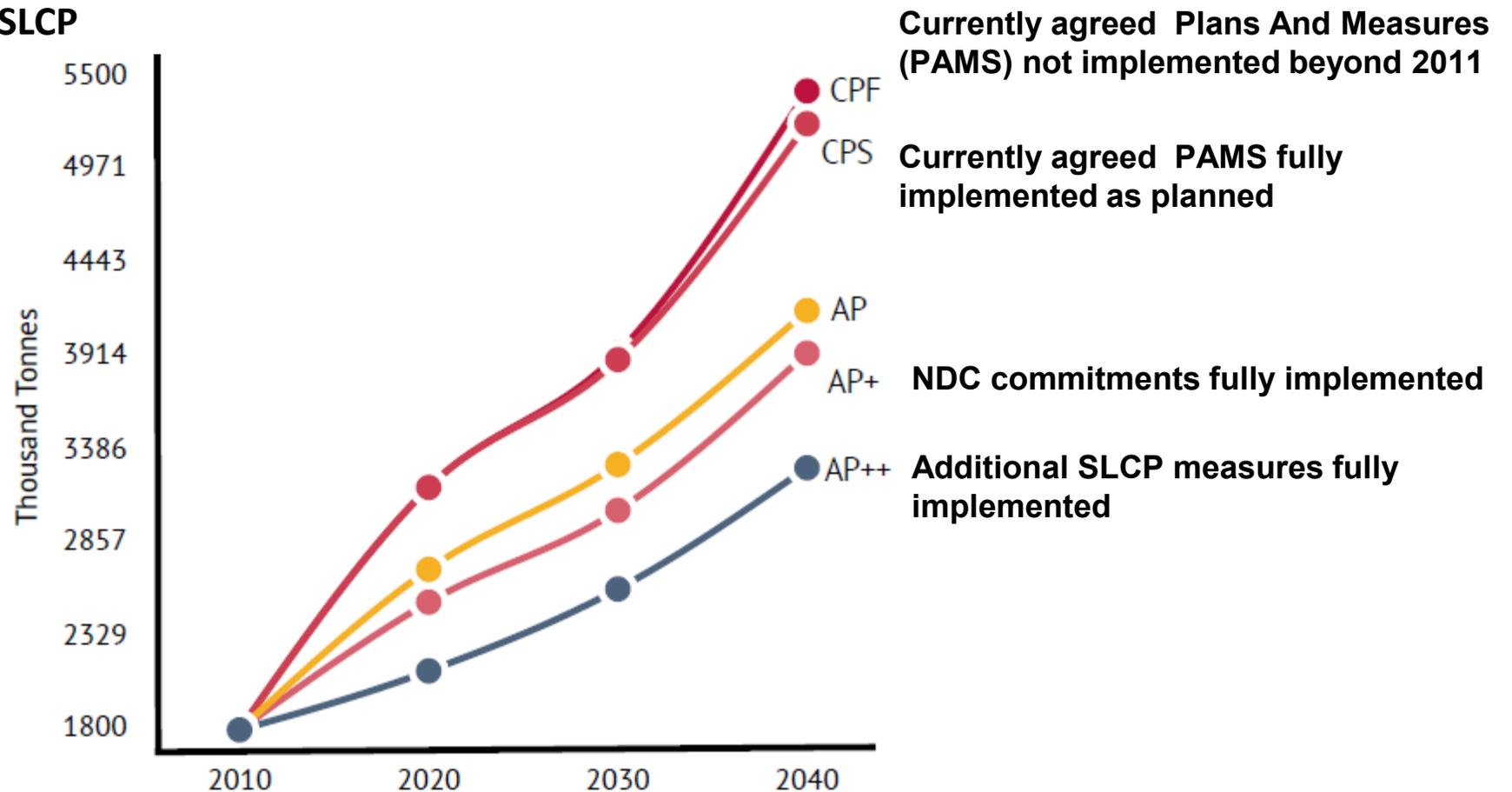
This information is the courtesy of J. Kuylenstierna and shall not be used without his written permission.

Avoided crop yield loss from emissions from Ghana under SLCP scenario – PAMS++



40% under NDC + SLCP
22% under NDC

Reduction in crop loss



Source: Ghana draft national plan

Fig 18 - Avoided impact of crop loss under different policy scenario

Conclusions

Integrated climate and air quality strategies make sense – creating policy coherence and are more cost-effective

LEAP-IBC can help look at climate consequences of air quality strategies, or air pollution consequences of climate strategies, or sectoral policy on both

Can concentrate on measures that can help to limit near-term warming and achieve air quality goals

Quantification of the benefits of action can be made using LEAP-IBC – highlighting local benefits of action

Efforts being made to include additional mitigation options in NDCs to ensure further action is taken on emissions