

GLOBAL METHANE, CLIMATE AND CLEAN AIR FORUM
WASHINGTON, DC USA
SEPTEMBER 26–30, 2022

Policies and Practices in Methane Regulations: Coal Sector's perspective



ENERGY



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Clark Talkington, Advanced Resources International, Inc.

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Sustainable Energy Division
United Nations Economic Commission for Europe



27 September 2022

Introduction

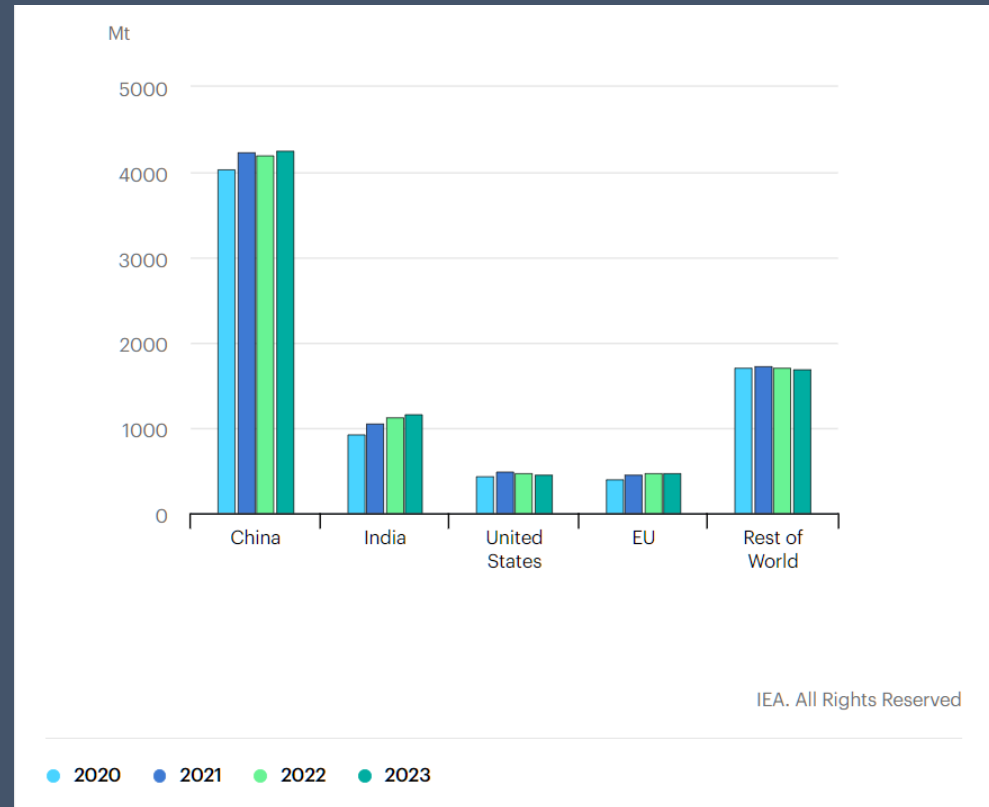
Mr. Raymond Pilcher

Chair, UNECE Group of Experts on Coal Mine Methane & Just Transition

Moderator

Coal Consumption projections 2020-2023

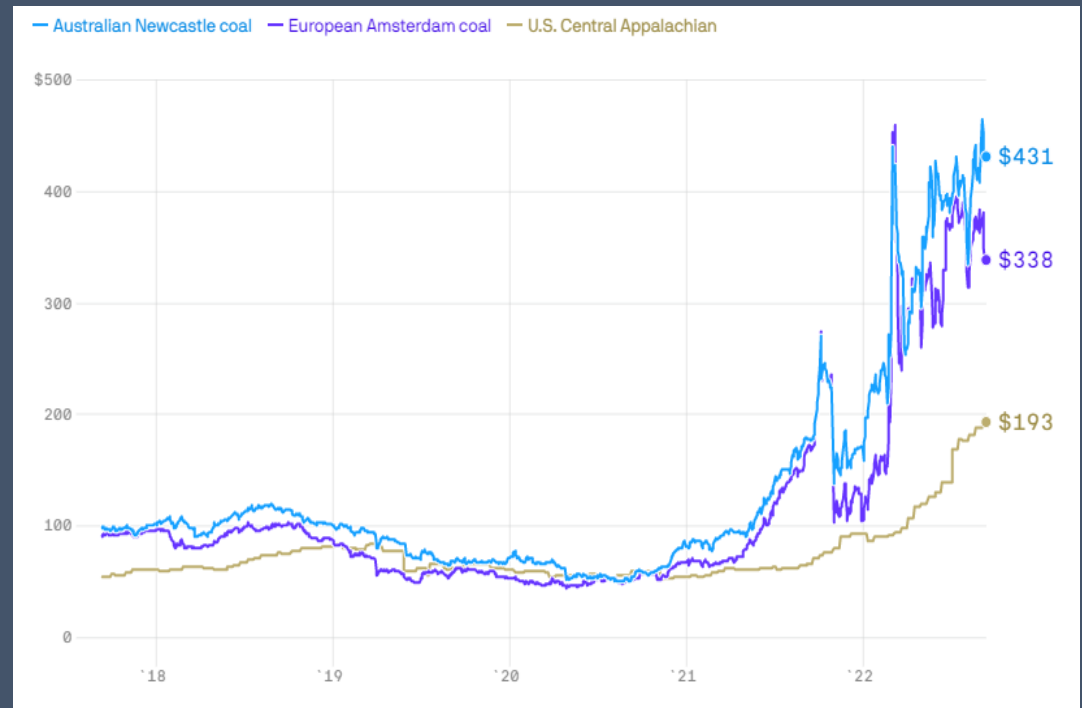
- Increase in consumption in Asia -- primarily in China and India
- United States consumption is decreasing—for now
- EU consumption will increase until Ukraine crisis is resolved



Market coal prices tell a story

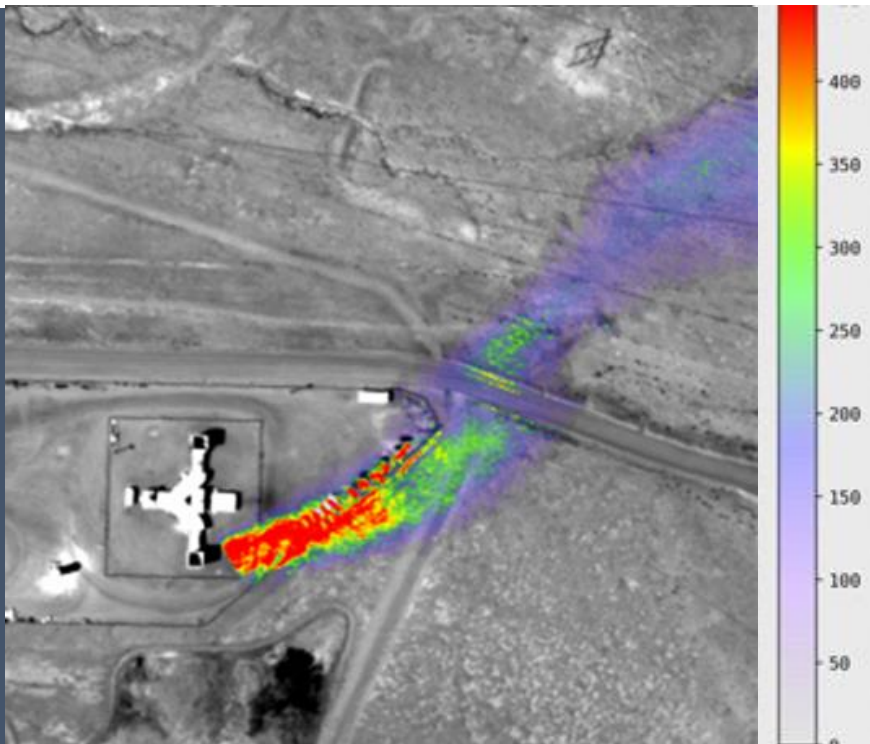
- Worldwide increase in prices reflect crisis in Ukraine, with European price escalation greater than North America---so far. After the conflict is resolved:
 - Coal production will have increased and there will be additional mines to close and personnel to reskill
 - Methane emissions will have increased
 - Mined land to be reclaimed, restored, and repurposed for the future will have increased
 - How much will alternate sources of primary energy increase?

Coal Prices September 2017-2022



EXAMPLES OF GHGSAT AIRCRAFT MEASUREMENTS

GHGSat-AV – Underground Coal Mine

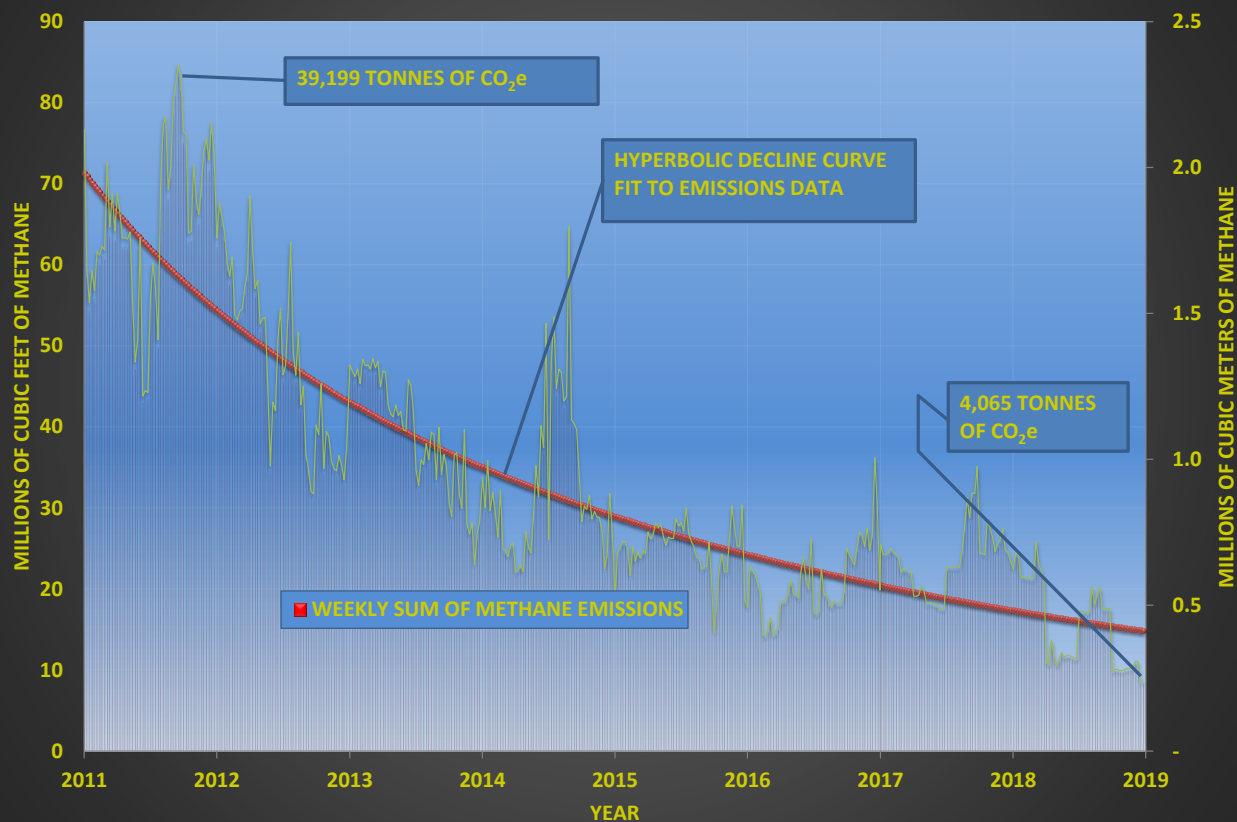


United States – San Juan Coal Mine Vent

2021

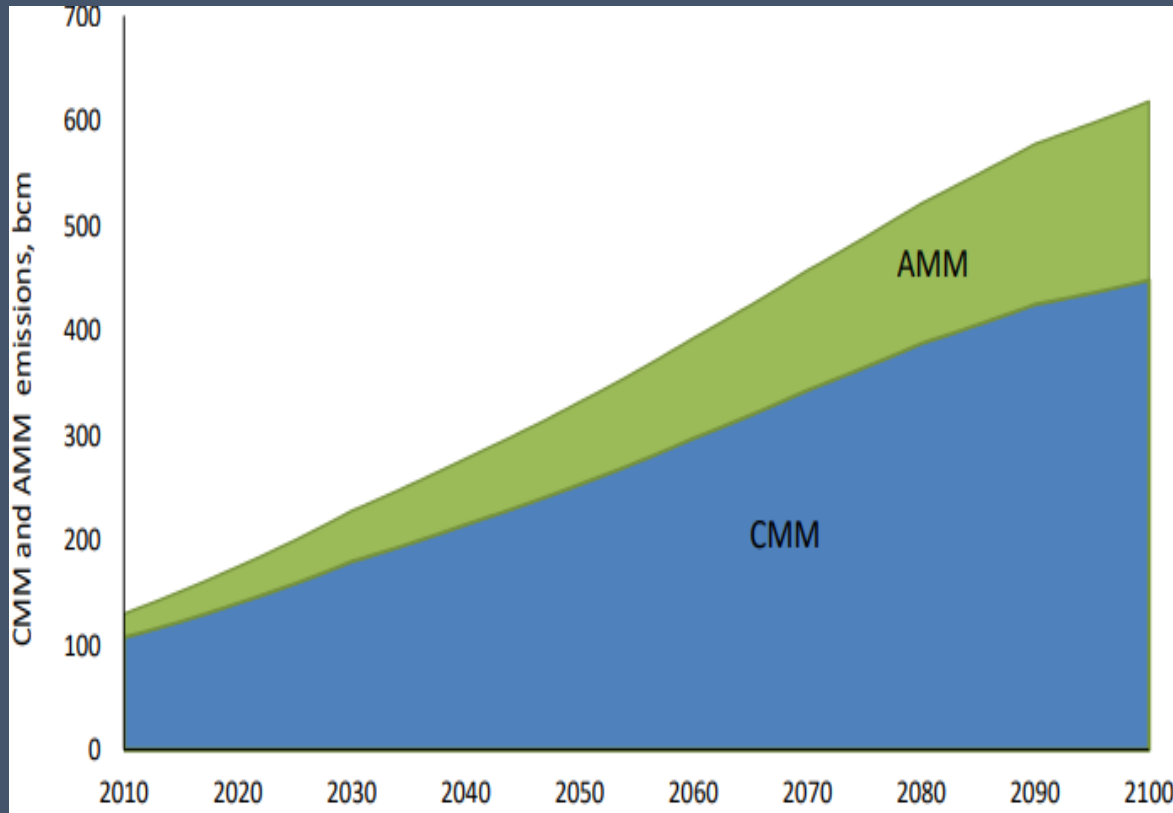
Point Source: 300 kg/hr

Approved for Public Release



Since 2011, methane emissions data reported to the USEPA from coal mines are available to the public. Presently, most of West Elk's fugitive methane is emitted from the ventilation system. Gas from gob drainage has diminished through time, but did make up to 50%.

Forecast global AMM and CMM emissions



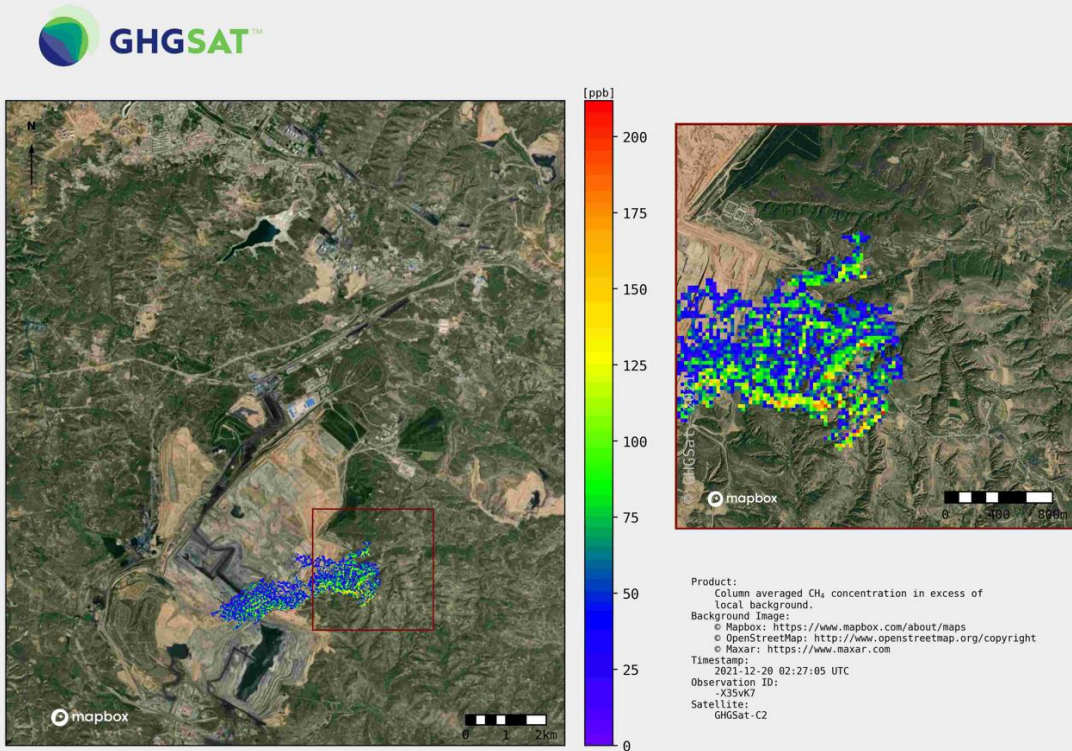
As of 2010, the share of abandoned mine methane (AMM) in total CH₄ emissions from coal was 17%. This share is expected to increase to 24% through to 2050

(Reference scenario, PNNL from Kholod et al, 2019)



Methane in an
open cast
mine—who
needs science?

EXAMPLES OF GHGSAT SATELLITE MEASUREMENTS



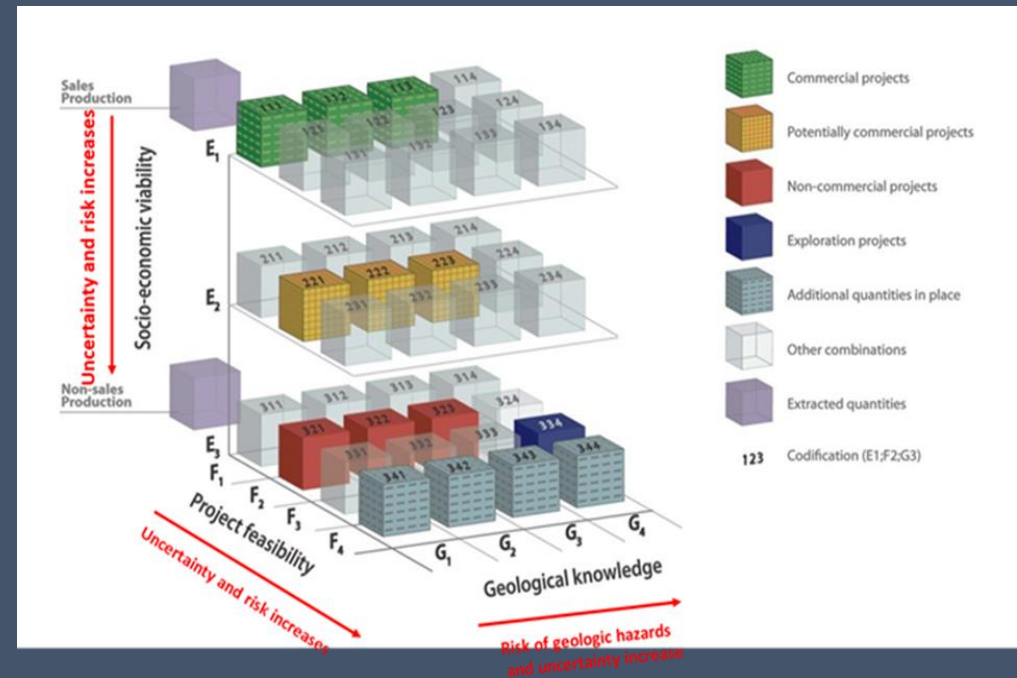
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China
December 2021

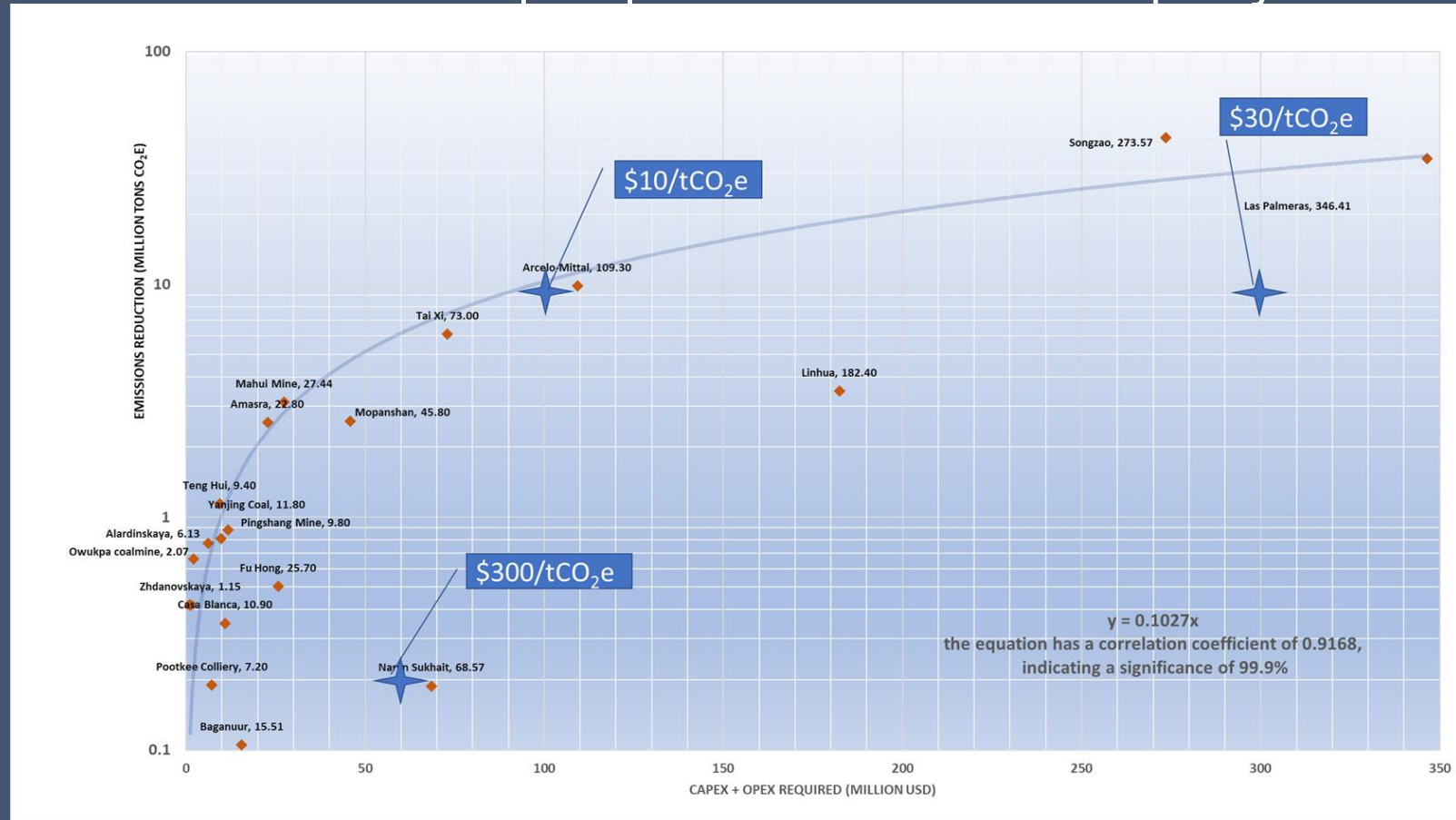
Point source 1: 2,132 kg/hr \pm 41%

Natural resources remain after coal mine closure-they must be managed

- Natural resources will remain after coal mines are closed
- They may be valued, or pose a threat to the environment—but managing these resources is crucial to repurposing mined land
- The United Nations Framework Classification is a key part of a system to manage resources and develop appropriate strategies for their future use
- Understanding the potential of non-coal resources, such as methane, water and other valuable materials is an important consideration when planning closure and repurposing



Methane emissions reductions and estimated CAPEX + OPEX for proposed coal mine projects



Thank You

Global Methane, Climate and Clean Air Forum

26-30 September 2022, Washington, D.C.



Strategies for mitigation of coal mine methane emissions

Clark Talkington

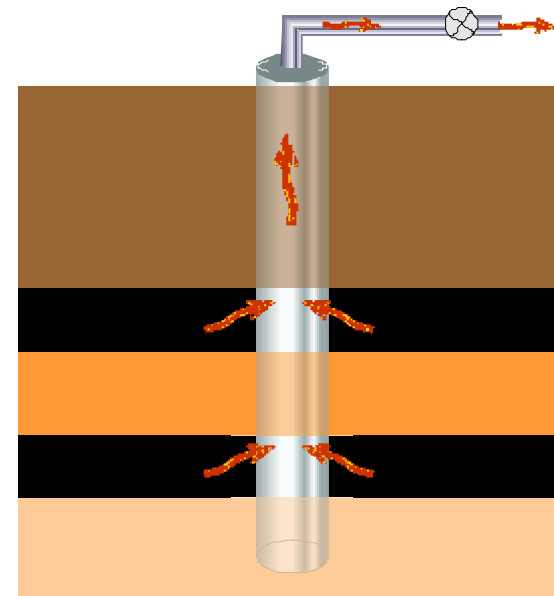
Advanced Resources International, Inc

Adapted from presentation by David Creedy,
Sindicatum Sustainable Resources, 17th session of
the UNECE Group of Experts on CMM and Just
Transition 21/22 March 2022

Methane mitigation at active mines – before mining

Remove more gas before mining starts

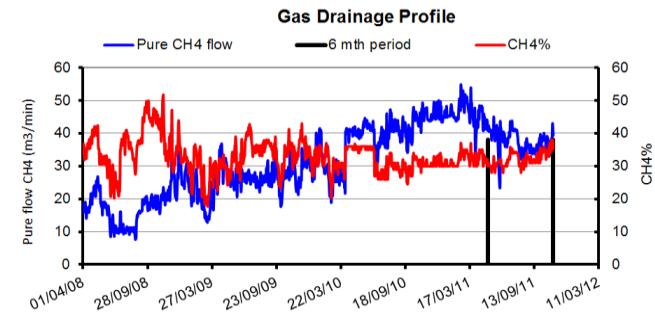
- Capturing and using/destroying more gas extracted from vertical surface boreholes or surface to in-seam boreholes with directional drilling
 - Extract gas from the seam to be worked and from floor and roof seams likely to be de-stressed during mining
- Underground pre-drainage before mining starts, of the seam to be worked
 - The penalty to the mine of protracted degassing is the time lag between mine development and coal production revenue
- Coal seam permeability, 'drillability' of strata, depth and geology are all critical factors but drilling and pre-drainage technology is continually improving



Methane mitigation at active mines – drained gas

Capture and use/destroy more gas during mining operations

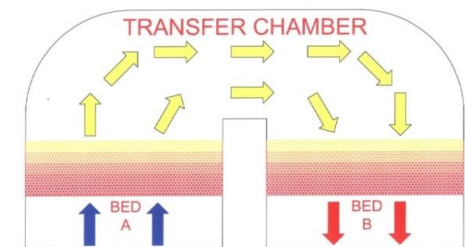
- Design and operate in accordance with best practice to maximize capture and ensure CH₄ concentration >25%
- Employ underground pre-drainage and/or enhanced post-drainage
- Drain sealed areas - equivalent to AMM in concept but mine staff are available to manage, operate and maintain the programme
- Use drained coal mine methane (CMM) for power generation or heating and destroy all unused methane by flaring



Courtesy of Sindicatum Sustainable Resources

Methane mitigation at active mines – Ventilation Air Methane (VAM)

- VAM is the gas that “escaped” the methane capture system - a fugitive emission or a waste product
- Maximum permitted VAM concentration in mine airways is usually less than 1% CH₄
- **60-80% of gas emitted from active coal mines is VAM which needs to be urgently addressed to achieve meaningful GHG emission reductions***
- VAM concentration and flow varies with the coal production cycle and with contributions from sealed area during barometric pressure drops
- Oxidation is currently the only commercially available option to reduce VAM emissions
- VAM mitigation only, and in some instances power generation, projects have been successfully implemented in Australia, China, UK and the USA but there are few currently in operation



*Approximate based on National Inventories, National Communications and experience

Methane mitigation at abandoned mines

Prevent methane release from abandoned mines

- Allow natural flooding by groundwater recovery to trap residual gas in place
- Accelerate flooding where safe, environmentally sound and practical

Extract and use/destroy abandoned mine methane (AMM)

- Use AMM for power generation or heating and destroy unused methane by flaring
- Flare AMM if utilisation is not feasible

Methane mitigation at surface mines

Extract and use/destroy surface mine methane (SMM)

- There are instances where gas is prevalent at surface mines
- Emissions are not measured but assumed based on the on the gas content of the coal (m³/t)

Extract and use/destroy SMM

- Use surface vertical pre-drainage wells to produce gas in advance of coal extraction
 - Air ingress will occur rapidly as extraction nears the well
 - Gas quality is generally high offering many options for utilization
 - Pre-drainage wells may produce significant volumes of water so a strategy should be in place to address produced water

Global Methane, Climate and Clean Air Forum

26-30 September 2022, Washington, D.C.



Examples of national efforts to regulate methane emissions

Clark Talkington

Advanced Resources International, Inc

Thank You

**Presentation supported by U.S. EPA
under the auspices of GMI**



Best Practices in Policies for CMM Mitigation

GMI-CCAC 2022 Forum
September 27, 2022



Introduction to American Carbon Registry (ACR)

- Founded in 1996 – First private voluntary greenhouse gas registry in the world
- Development of rigorous, science-based standards and methodologies
- Oversight of high-quality offset project listing, verification, registration, offset issuance, serialization, and on-line retirement reporting
- Subsidiary of Winrock International
- Approved by California Air Resources Board (CARB) to be an Offset Project Registry
- Approved by International Civil Aviation Organization (ICAO) for the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

Where do carbon markets fit in CMM BMPs?

Introduction to ACR

Overview of MMC Crediting

Current US CMM Policies
and Practices

State of MMC Carbon Credits
and Future Projections at ACR

MMC Activities
within Voluntary,
Subnational, and
International
Carbon Markets

Potential Stacking of
Incentives from
Carbon Markets and
State Programs



Current U.S. CMM Policies & Practices

- Applicability and limitations of U.S. laws
 - MSHA Ventilation Plans, Degasification Systems, etc.
 - USEPA CAA (40 CFR 52.21) and GHGMRR (Part 98, Subpart FF)
 - Potential state/local permitting for O&G wells and/or process equipment
- Use of captured coal mine methane (CMM)
 - Mostly limited to mines with highest CH₄ concentrations
- Opportunity for carbon credit markets and state incentives like renewable / alternative energy credits (RECs / AECs)
 - Offsets must be a GHG emission reduction or GHG removal that is real, additional, quantifiable, permanent, verifiable, and enforceable

MMC Activities within Carbon Markets (1)

- Voluntary Carbon Market (VCM)
 - Main registries with Mine Methane Capture (MMC)
 - ACR
 - Carbon Action Reserve (CAR)
 - Verra (VCS)
 - Ongoing integrity discussions with open public consultations
 - Voluntary Carbon Market Integrity Initiative (VCMIi)
 - Integrity County for the Voluntary Carbon Market (ICVCM)
- International Carbon Markets
 - ICAO's CORSIA
 - Paris Agreement's Article 6
- Subnational Carbon Markets
 - Offsets in CA Cap & Trade Program
 - 17 CCR Sections 95970 - 95989
 - Credits in the *proposed* CO Recovered Methane Protocol Rule
 - CO Clean Heat Plan (SB 21-264)
 - <https://cdphe.colorado.gov/air-pollution/climate-change#CleanHeat>
 - Offsets in WA Cap & Invest Program
 - RCW 70A.65.170

Potential
Linkages
?

MMC Activities within Carbon Markets (2)

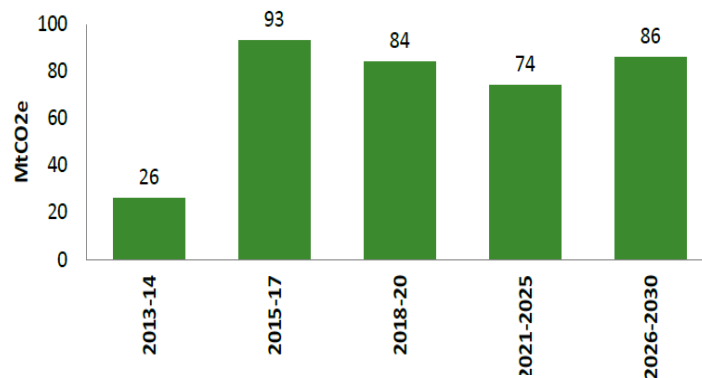
Figure 1. Voluntary Carbon Market Size by Value of Traded Carbon Credits, pre-2005 to 31 Dec. 2021



Source: Ecosystem Marketplace, a Forest Trends Initiative.

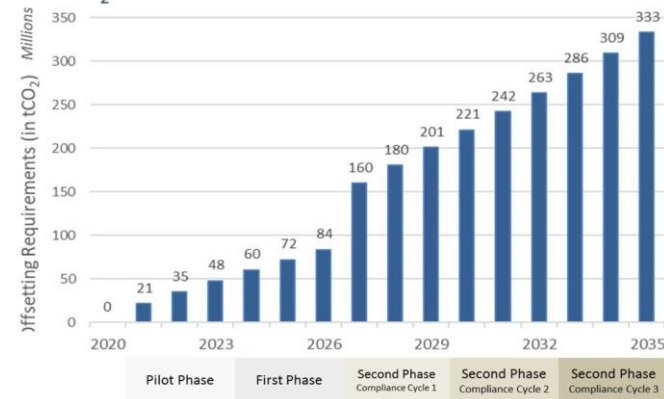
Offsets can be used for over 200 million tons through 2020

Offsets can be used for an additional 160 million tons through 2030*



*Post-2020 estimates based on 2020 and 2030 caps in 2017 Scoping Plan Update, p.13 with 5% annual reduction (https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf) and AB 398 offset limits

Total offsetting requirements are estimated to approximately 2.5 billion tonnes of CO₂ from 2021 and 2035.

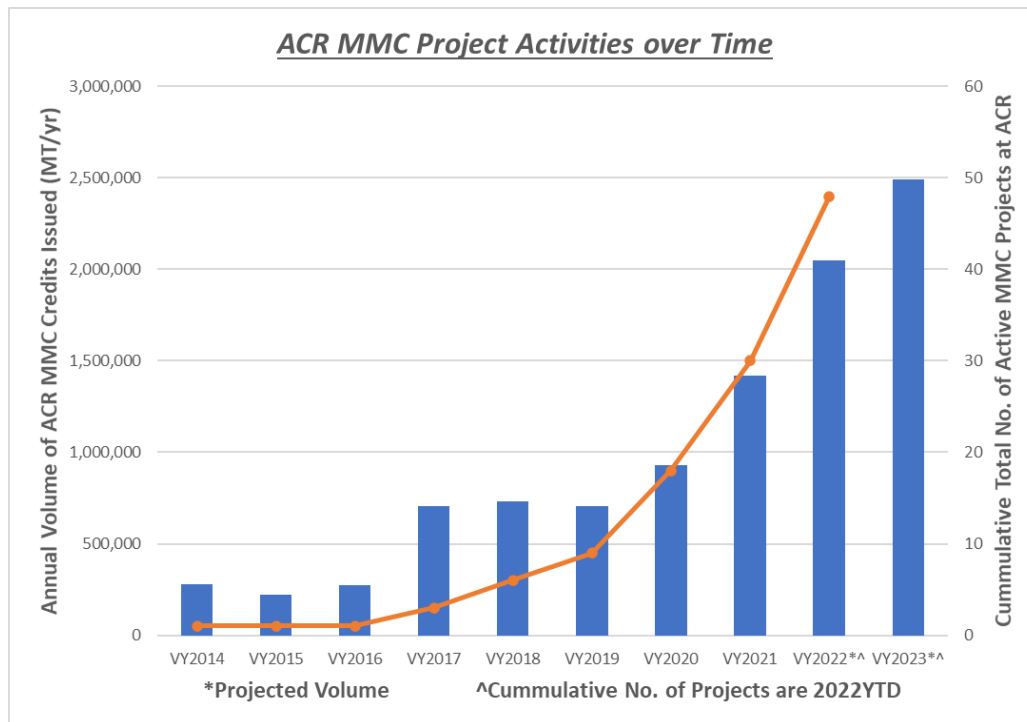


Source: ICAO CORSIA

Overview of MMC Crediting

- Eligibility Criteria
 - CMM that would otherwise vent to atmosphere with an MMC project
 - Project types (e.g., VAM, AMM)
 - End uses (e.g., injection into NG pipeline, power generation, flaring)
 - Methane sources (e.g., pre-mining surface wells, post-mining gob wells)
 - Prohibitions against CBM, pipeline injection, previous wells, etc. in certain situations
- GHG Emission Reduction (ER) Quantification
 - Baseline Emissions (BE) minus Project Emissions (PE)
 - In-scope sources, sinks, and reservoirs (SSRs)
- Monitoring, Instrument QA/QC, Recordkeeping, and Reporting Requirements
- 3rd Party Verification and Credits Issuance

State of MMC Carbon Credits and Future Projections at ACR



- ACR-listed project end-uses
 - 1 uses thermal incineration
 - 1 uses pipeline injection
 - 1 uses power generation
 - 45 use flaring
- ACR-listed project types
 - 1 project uses ventilation air methane (VAM)
 - 19 projects use active underground drainage CMM
 - 28 projects use abandoned mine methane (AMM)

Potential Stacking of Incentives from Carbon Markets and State Programs

- State programs that include CMM and/or CBM
 - CO Renewable Portfolio Standard (RPS)
 - IN Voluntary Clean Energy Portfolio Standard Program
 - OH Alternative Energy Resource (AERS)
 - PA Alternative Energy Portfolio Standard (AEPS)
 - UT Energy Resource and Carbon Emission Reduction Initiative
- Other incentives include accelerated depreciation, royalty relief, and lease amendments



THANK YOU



Overview

Michal Drabik

Chief of Section, Economic Affairs

Sustainable Energy Division

Secretary

UNECE Group of Experts on Coal Mine Methane & Just Transition



The Paris Agreement

- A legally binding international treaty on climate change
- Adopted by 196 Parties at COP 21, 12 Dec. 2015, entered into force on 4 Nov. 2016.
- To **limit global warming to 2**, preferably to **1.5 degrees C**, compared to pre-industrial levels.
- Works on a **5-year cycles** of increasingly ambitious climate action carried out by countries.
- By 2020, countries submitted their plans for climate action - nationally determined contributions (**NDCs**).
- NDCs
 - Countries indicate **actions** they will take to reduce their GHG emissions to reach the goals of PA.
- Finance
 - Reaffirms that **developed countries should take the lead** in providing financial assistance to countries that are less endowed and more vulnerable, and encourages voluntary contributions by other Parties



Global Methane Alliance

- Initiative by CCAC
- Started: 2019
- To support ambitious methane reduction targets from the oil and gas industry
- Countries that join the GMA commit to **include methane reduction targets from the O&G sector in their NDCs**, as part of their GHG reduction targets.
- Brings together governments, financing institutions, IO, NGOs, and industry.
- Countries have a choice:
 - an **absolute reduction target** of at least 45% reduction in methane emissions by 2025 and 60% to 75% by 2030, or
 - a **methane intensity target** of 0.25% or below, depending on their actual methane emissions and of the level of development of their oil and gas industry..



Global Methane Pledge

- Launched at COP 26 in November 2021 in Glasgow by the US and the EU
- 122 State participants, representing nearly 50% of global anthropogenic methane emissions and over two thirds of global GDP,
- Supporters: UNECE, UNEP, IEA, CCAC, EIB, EBRD, GMI, etc.
- Participants joining the Pledge agree to take **voluntary actions to reduce global methane emissions at least 30 percent from 2020 levels by 2030.**
- Global, not a national reduction target.
- Participants commit to **working to continuously improve the accuracy, transparency, consistency, comparability, and completeness of national GHG inventory reporting** under the UNFCCC and Paris Agreement.



International Methane Emissions Observatory

- Launched at the G20 Summit
- A data-driven initiative by the UNEP with support from the EC **to catalyze reduction of methane emissions**, starting with the energy sector.
- **Connects data with action on research, reporting, and implementation.**
- **Collecting, integrating, and reconciling methane data from multiple sources** (companies, satellites, scientific studies, national inventories) **to generate a coherent and policy-relevant global public dataset** of empirically verified **data of methane emissions levels and sources.**
- Is to serve as a key implementing vehicle of GMP by creating a sound scientific basis for methane emissions calculations.
- It is not IMEO by itself that will deliver emission reductions.



Global Methane Initiative

- An international public-private partnership focused on **reducing barriers to the recovery and use of methane as a valuable energy source.**
- To advance cost-effective, near-term methane abatement, recovery and use by:
 - **Identifying opportunities** for emissions reductions
 - **Fostering best practices** and effective policies
 - **Sharing technical resources and strategies and providing technical support** to deploy methane-to-energy projects around the world.
 - **Increasing capacity** and skills to address methane
 - Hosting webinars and collaborative events
- Focuses on three key sectors: Oil and Gas, Biogas, and Coal Mines



The Oil & Gas Methane Partnership 2.0 (OGMP 2.0)

- It is a multi-stakeholder initiative launched by UNEP and CCAC.
- A comprehensive, **measurement-based reporting framework** aiming to **improve the accuracy and transparency of methane emissions reporting**.
- Focused on the Oil and Gas industry, with plans to expand it to the coal sector
- The OGMP 2.0 data is one of the key components of IMEO
- Members:
 - Over 80 companies representing a significant share of the world's O&G production.
 - Operators of gas transmission, distribution, and storage infrastructure + LNG terminals
- Partners
 - UNEP, EC, CATF, EDF, CCAC
 - BP, ENI, OXY, Shell, Repsol, Total, etc.
 - Supporting partners: UK, Norway



The proposed EU regulation on methane (1)

➤ Aims to

- **Improve the accuracy of information on the main sources of methane emissions** associated with energy produced and consumed within the EU.
- **Ensure further effective reduction of methane emissions** across the energy supply chain in the EU.
- **Improve the availability of information** to provide incentives for the reduction of methane emissions related to fossil energy imported to the EU.
 - It **introduces transparency tools** for methane emissions occurring outside the Union.
 - It sets:
 - an **information obligation by importers** of fossil fuels with regards to methane emissions,
 - a **transparency list** of Union companies and countries and companies exporting fossil energy to the Union, including information on their international methane emissions reporting obligations.

- It focuses on the oil and gas and the coal sectors.



The proposed EU regulation on methane (2)

- In terms of the coal sector the proposed regulation
 - Requires
 - **Mine operators** to perform continuous **VAM emissions measurement** and quantification on all exhaust ventilation
 - **Drainage stations operators** to perform continuous **measurements of volumes of vented and flared methane**
 - **Surface operators** to use deposit-specific coal mine methane emission factors to **quantify emissions** resulting from mining operations
 - **Mine operators** to **estimate coal post-mining emissions** using coal post-mining emission factors, and update them annually
 - **Operators and drainage station operators** to annually **submit a report** to the competent authorities **containing yearly source-level methane emissions data**
 - **Member States** to **develop and implement a mitigation plan to address methane emissions from abandoned coal mines** and submit it to competent authorities 36 months from the date of entry into force of the Regulation



The proposed EU regulation on methane (3)

- In terms of the coal sector the proposed regulation
 - **Prohibits**
 - Effective 1/1/2025, **venting and flaring of methane from drainage stations of operating underground coal mines**, except in the case of an emergency, a malfunction or where unavoidable and strictly necessary for maintenance
 - effective 1/1/2027, **venting of methane through ventilation shafts** in coal mines emitting more than 0.5 tonnes of methane/kilotonne of coal mined, other than coking coal mines
 - **States that**
 - Three years from the date of entry into force of the Regulation the Commission shall adopt a delegated act setting out restrictions on venting methane from ventilation shafts for **coking coal mines**



The proposed EU regulation on methane (4)

- In terms of the coal sector the proposed regulation
 - States that
 - 12 months from the date of entry into force of the Regulation **Member States** shall **set up** and make publicly available **an inventory of all closed coal mines and abandoned coal mines** in their territory
 - 18 months from the date of entry into force of the Regulation **measurement equipment** shall be **installed on closed coal mines and abandoned coal mines** where operations have ceased 50 years prior to the date of entry into force of the Regulation
 - **Mine operators** shall be **responsible for** complying with the above mentioned equipment **installation and reporting requirements as regards closed mines** (those with an identified operator, owner or licensee and closed according to the applicable licensing requirements or other regulations) and
 - **Member States** as regards **abandoned mines** (those where an operator, owner or licensee cannot be identified, or that has not been closed in a regulated manner)



The proposed EU regulation on methane (5)

- In terms of the coal sector the proposed regulation
 - It **attributes a verification role with respect to methane emissions data to IMEO**, in particular with regard to the following tasks:
 - aggregation of methane emissions data;
 - verification of methodologies and statistical processes employed by companies to quantify methane emissions data;
 - development of data aggregation and analysis methodologies
 - publication of aggregated company reported data by core source and by level of reporting, classified by operated and non-operated assets
 - reporting of findings on major discrepancies between data sources.
- It is currently in consultation process.



Focus and Scope - Summary

- Regulations of methane emissions from the energy sector usually give the main focus to the oil and gas sector. Their scope typically includes:
 - Upstream oil and gas activities, that is exploration, production, and processing
 - Gas transmission and distribution
 - Storage
- If **coal sector** is addressed, the following issues are typically addressed:
 - **Flaring** (prohibiting it or significantly limiting by a given date)
 - **Drainage systems** (limiting the amount of emissions per tone of the mined coal)
 - **VAM** (limiting the amount of emissions per tone of the mined coal)
 - **Measuring** (setting the requirements, referring to their scope, frequency, and detail)
 - **Reporting** (setting the requirements, referring to their scope, frequency, and detail)
 - At certain occasions emissions from **abandoned mines**, referring to requirements of measuring, reporting, and mitigating emissions and setting up responsible parties.

Thank you!



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Proposed regulations – technical issues

Clark Talkington

Advanced Resources International, Inc



Greenwashing and outsourcing emissions

Michal Drabik

Chief of Section, Economic Affairs

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Problem

- The planet does not care about the borders, the politicians do.
- What if we **account the emissions originating from the activities of the companies registered in a given country to that country**, rather than to the states from which they originate
- Coal is being extracted because there is the demand for it. The same applies to any other commodity or product.
 - What if we **attribute the emissions to the consumers?**
- The rich States outsource its production to the poorer ones, from which they then import those products, only to criticize those states for not being environmentally friendly



Need for Just Transition mechanisms in the coal sector's methane regulations

- **Cutting methane emissions from coal mines to the level that is acceptable from the environmental point of view is unreconcilable with continuation of coal mining.**
 - Technical and financial limitation on how much methane mine operators are able to capture and use.
 - The main issue is with VAM.
- **Either set the threshold of the emission cuts at the level that is technically and financially possible to meet, or redirect our coal sector methane mitigation efforts to the debate on mine closure.**
 - In the latter case, we should do that through the Just Transition programmes.

Thank you!



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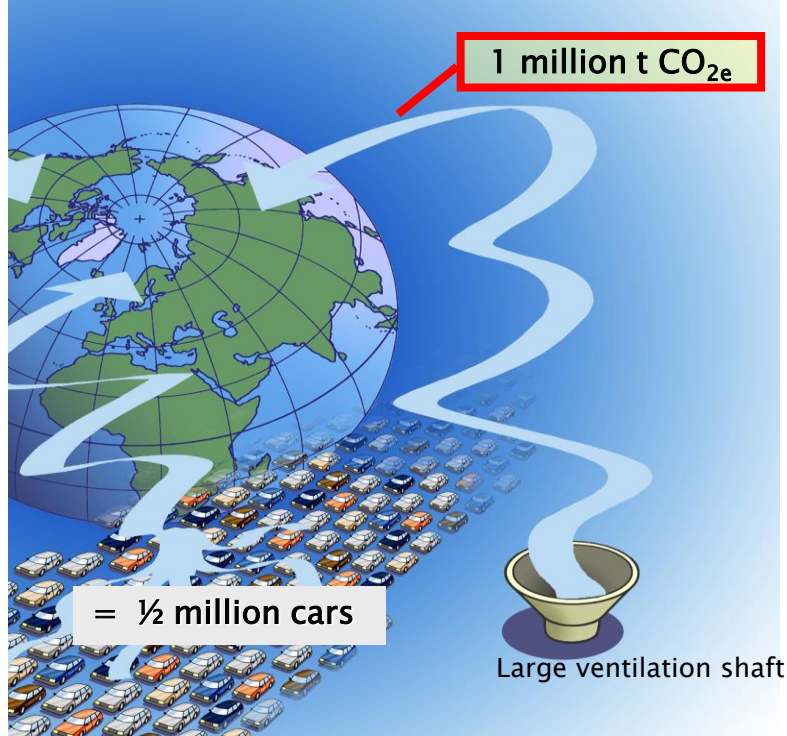
It's all about
DRIVERS !!

– and Clear Rules of Play
.. an example

Richard Mattus, *RM Business Consulting AB*



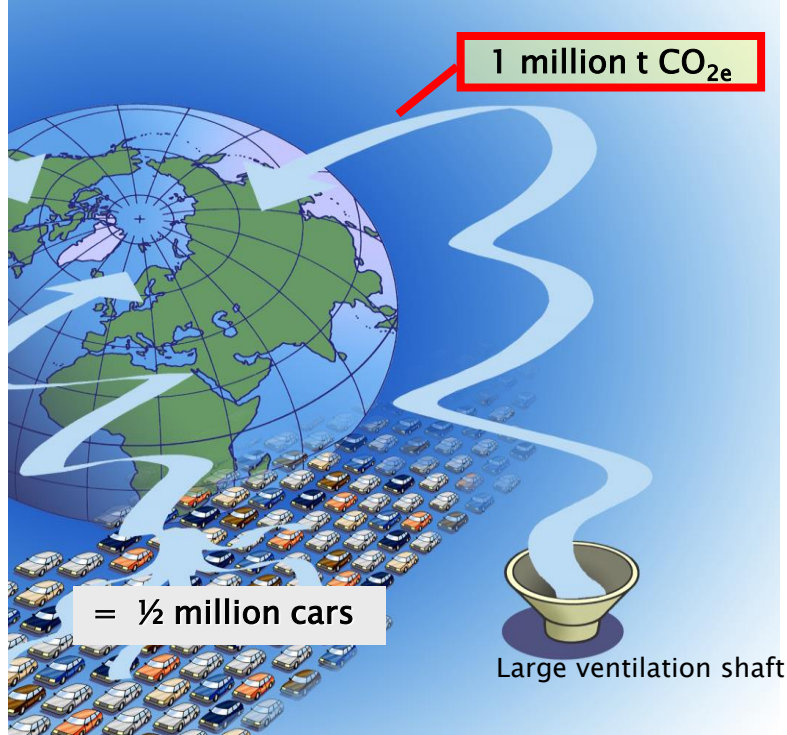
Importance of Drivers – example VAM



In coal mining: ~70% of methane emissions come as VAM.

Large shaft ~1 million t CO_{2e}
(with GWP of methane = 25).

Effect on Global Warming is similar to that of emissions from ½ million cars.



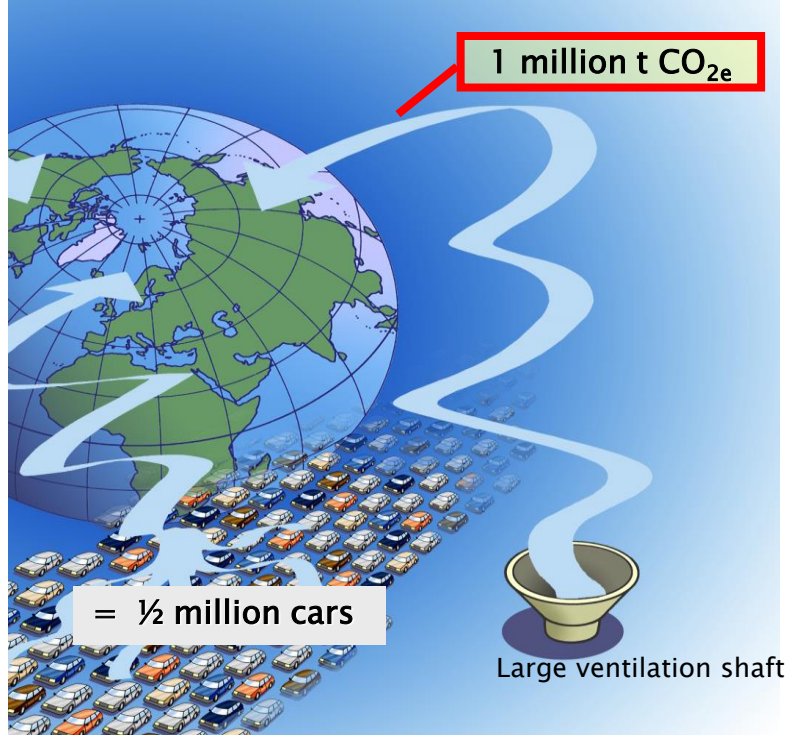
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* Old IPCC assessment, based on 100 years comparison to CO₂.
Latest assessment by IPCC, based on 20 years comparison to CO₂ = 82



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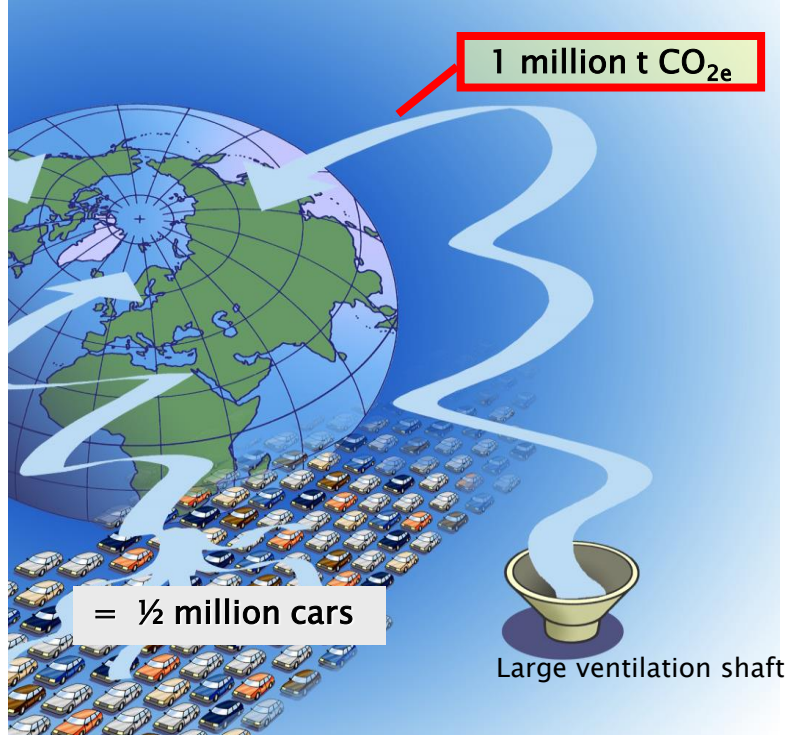
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Importance of Drivers – example VAM



- 2007: Company MEGTEC contracted VAM processing at WestVAMP, Australia
 - Applying RTO technology (proven in industry since 1970's)
 - Operated 10 yrs with high efficiency and high availability
- By 2009, MEGTEC negotiated 30 VAM contracts globally. When climate talks in Copenhagen failed to extend the Kyoto Protocol, all 30 investors backed out – concerned about value of reduction credits post 2012.
- Still by 2022, there are only a handful of VAM processing plants globally. Should have been hundreds – considering the amount of emissions reduced!



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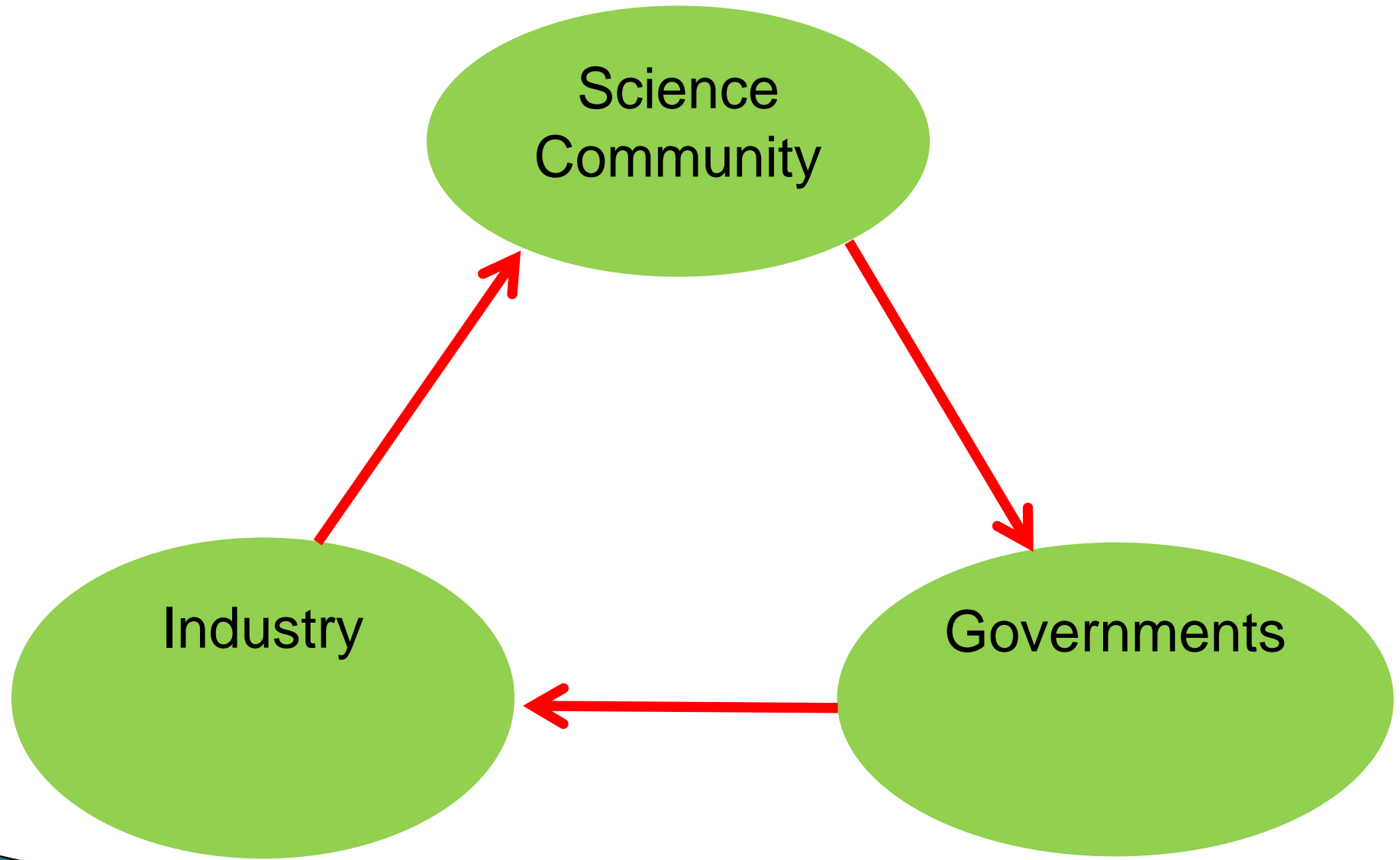
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CONCLUSION:

When industry has clear Rules of Play
and a Value of Emission Reductions,

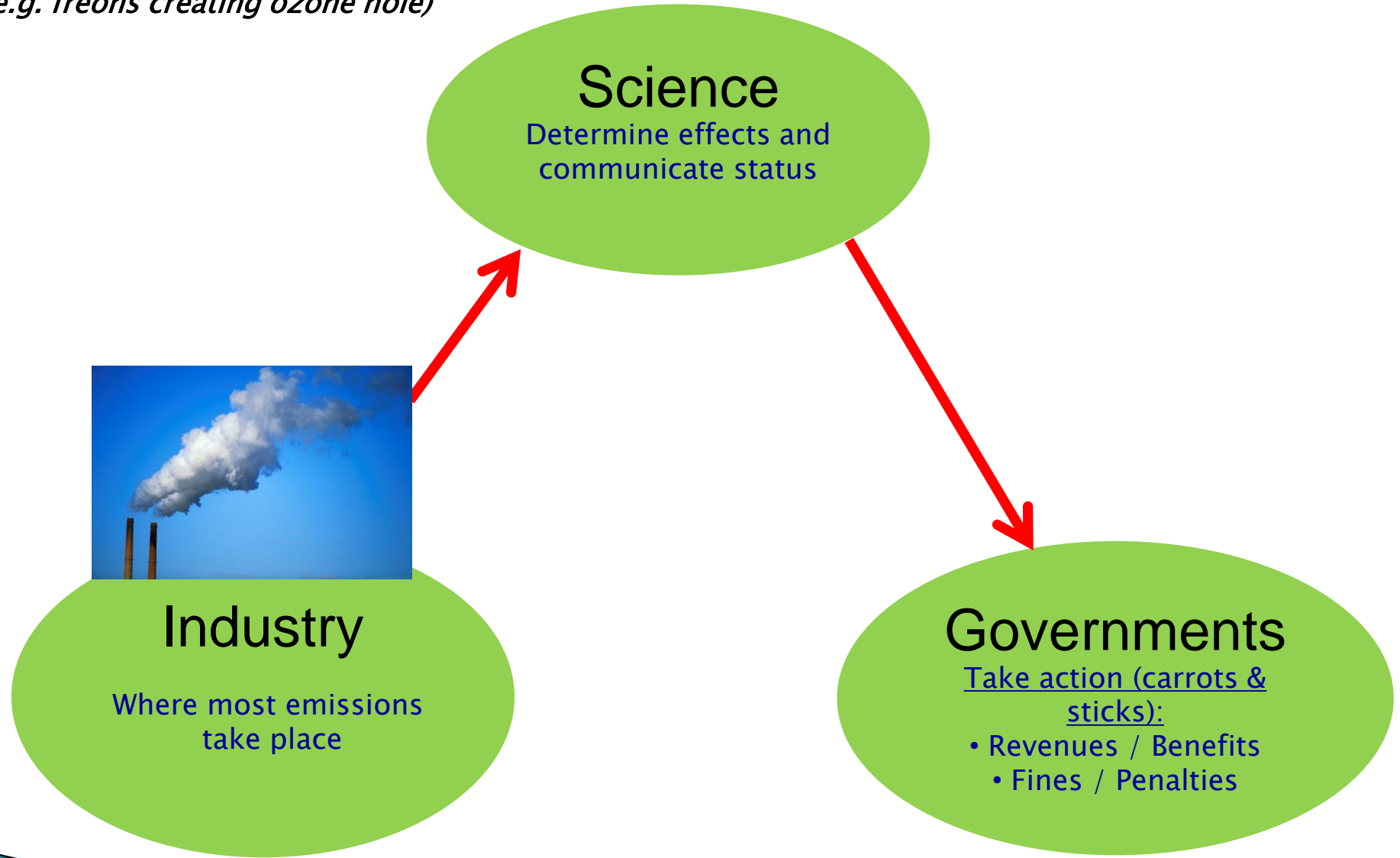
then they can calculate for loss or for
gain
– and action is being taken.

"Triple Helix Model" on interaction Industry–Science–Government



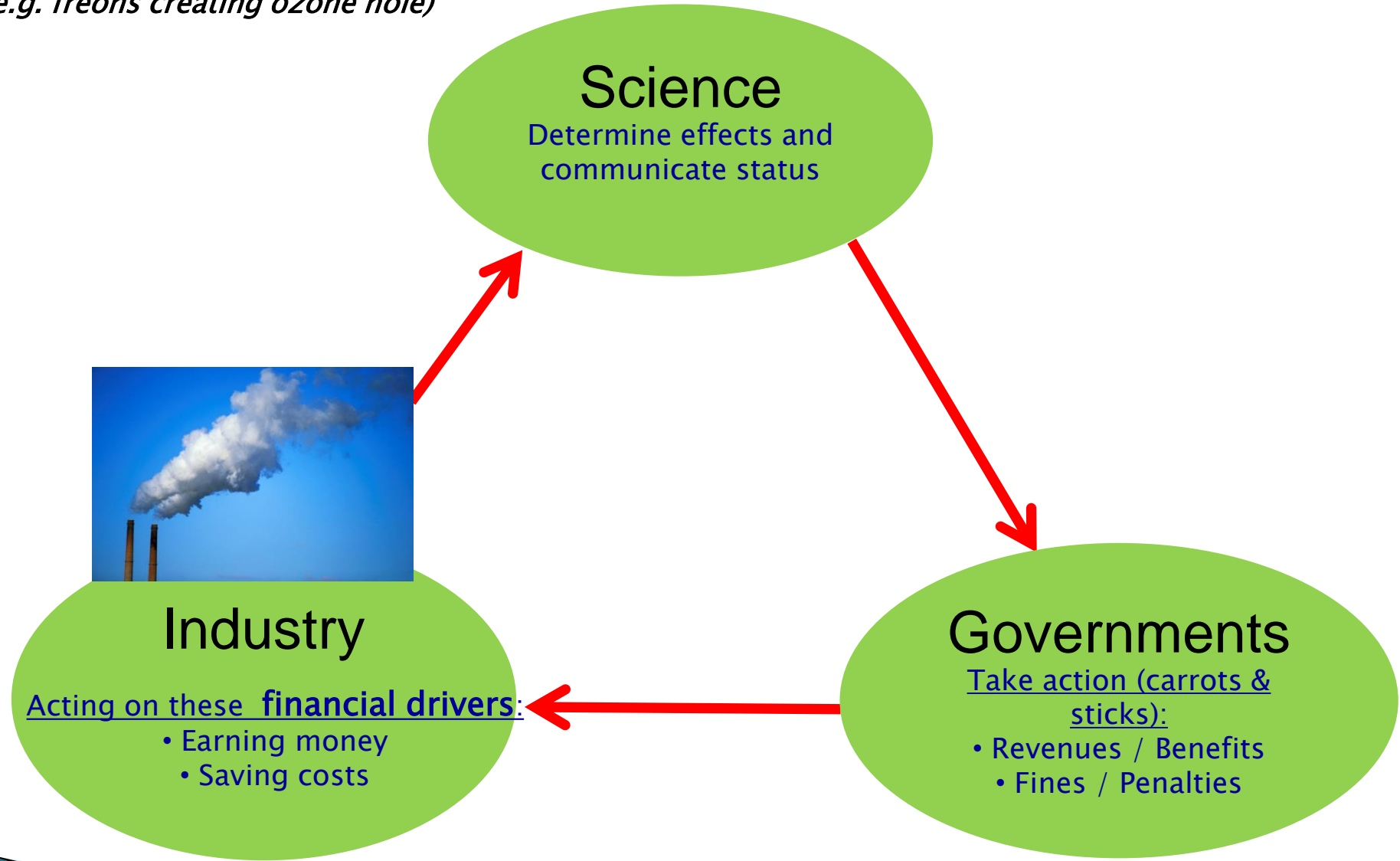
Dealing with *emission issues* in general

(e.g. freons creating ozone hole)



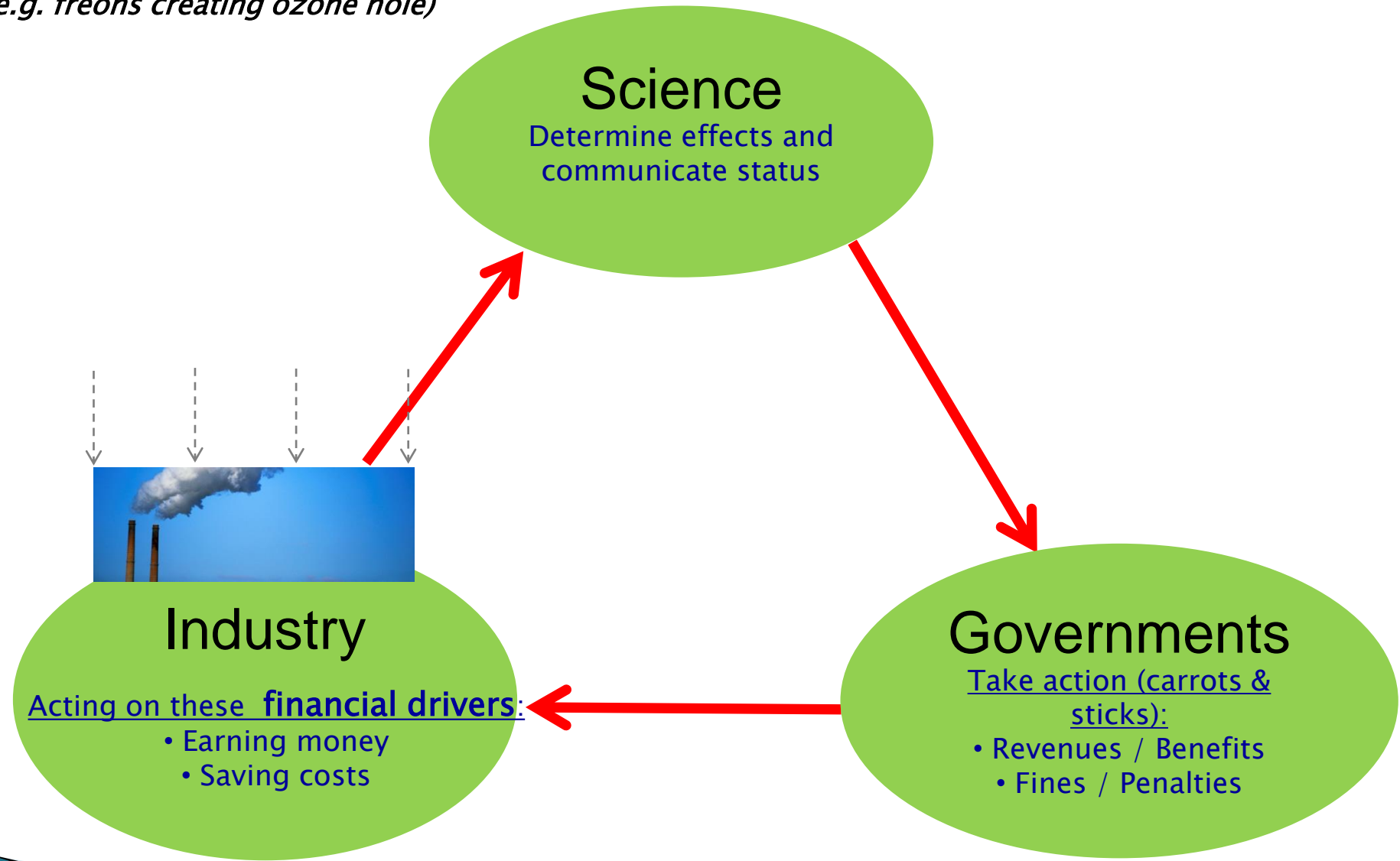
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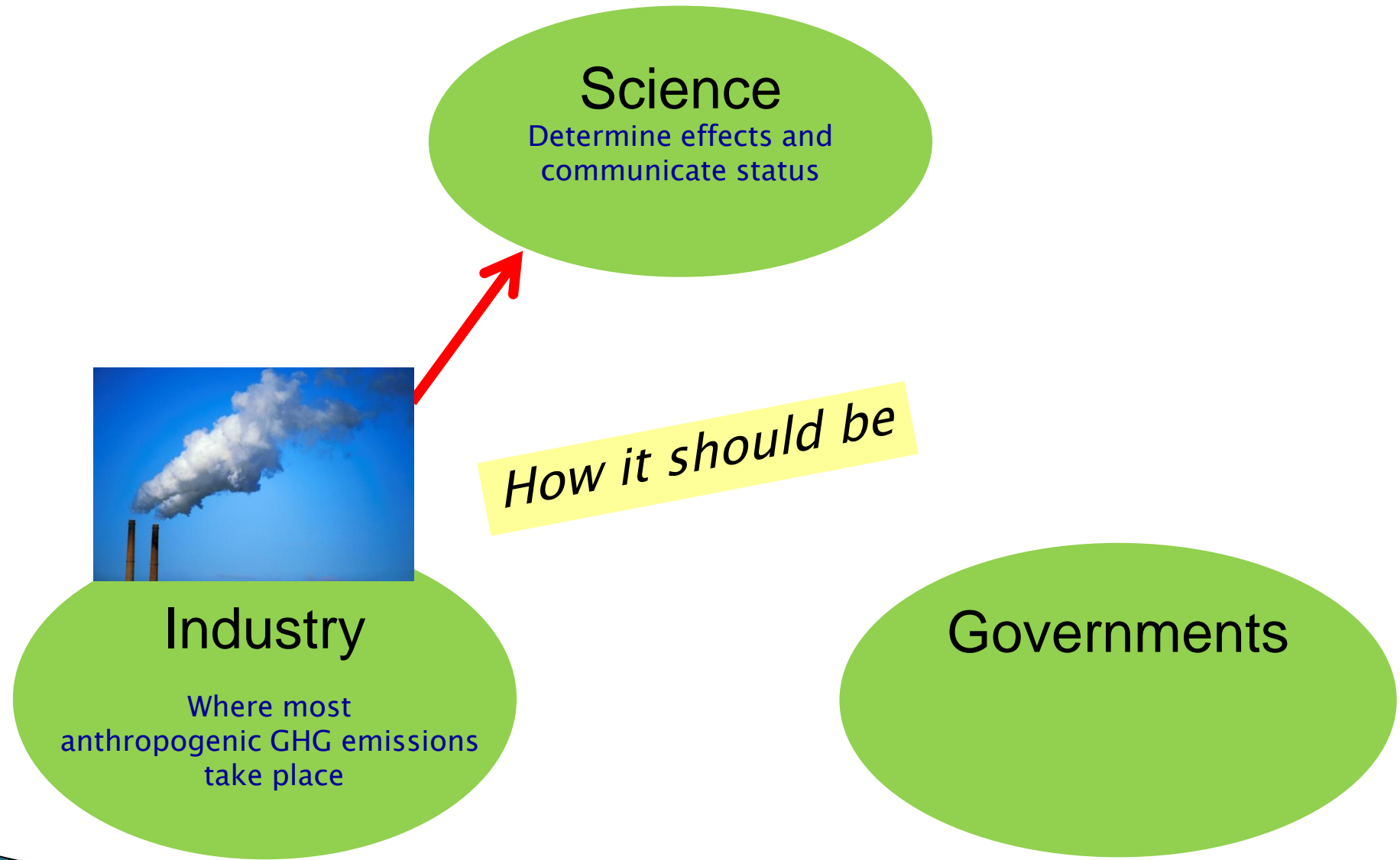


Dealing with *emission issues* in general

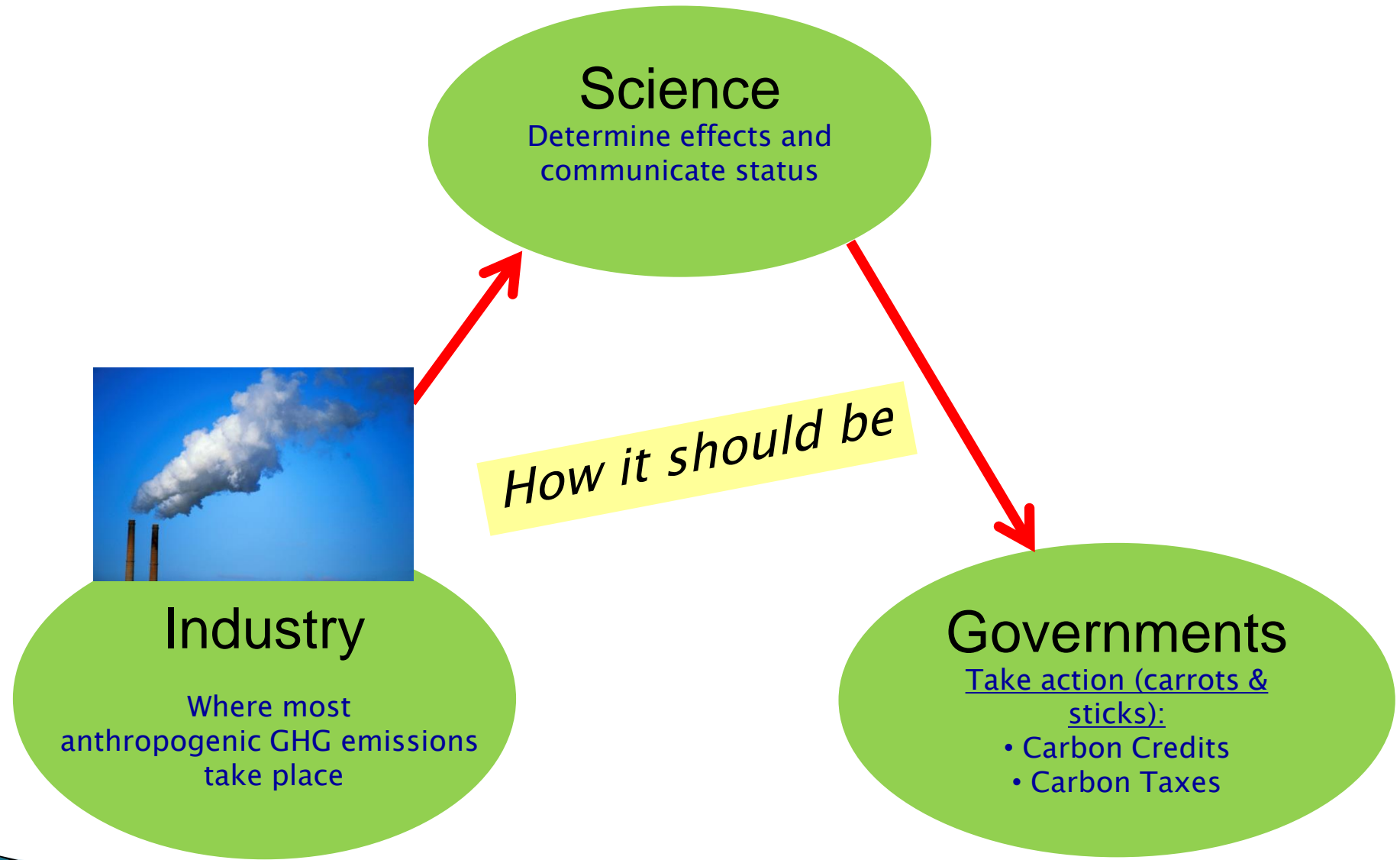
(e.g. freons creating ozone hole)



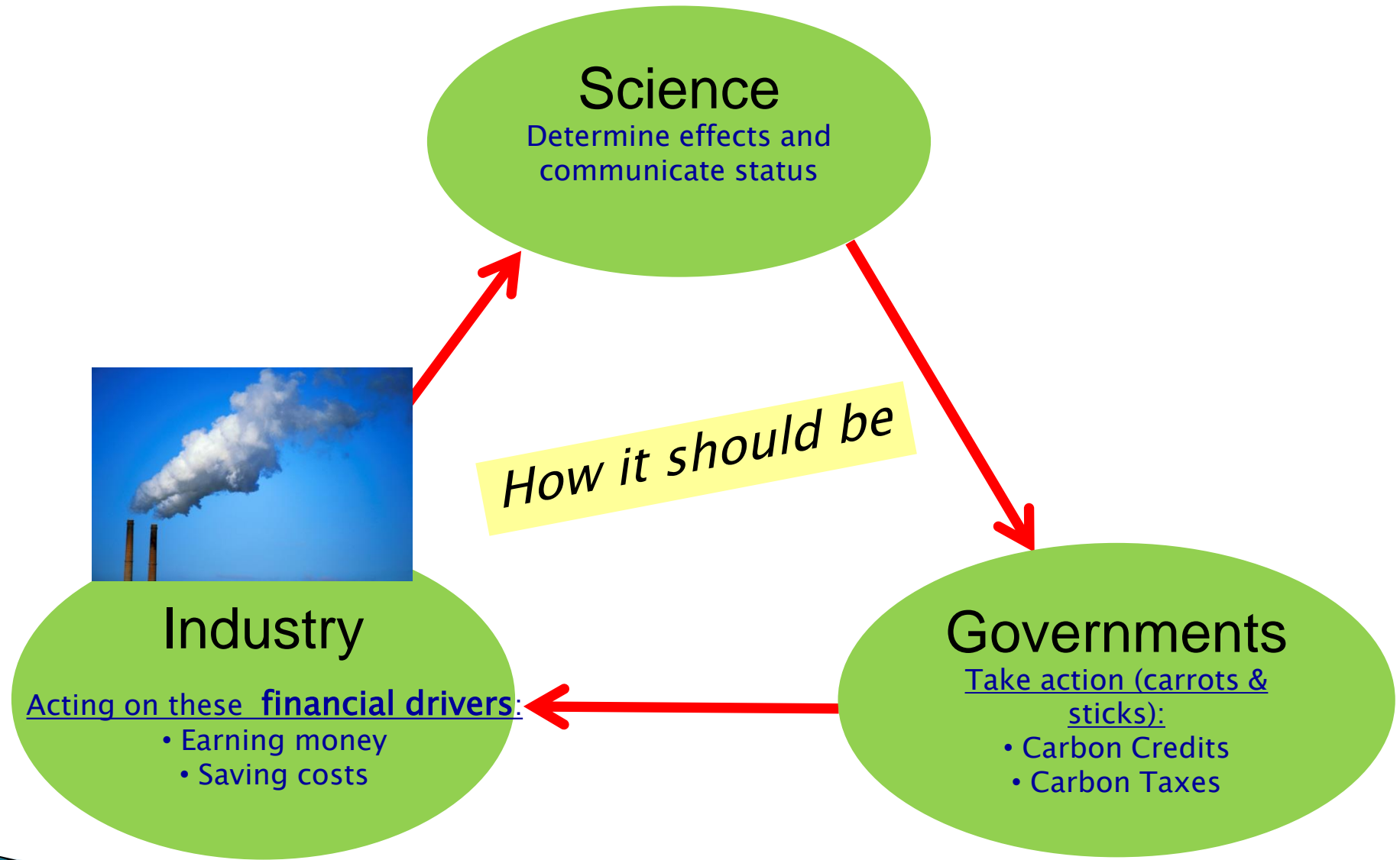
Dealing with the climate change issue (CO₂ and methane)



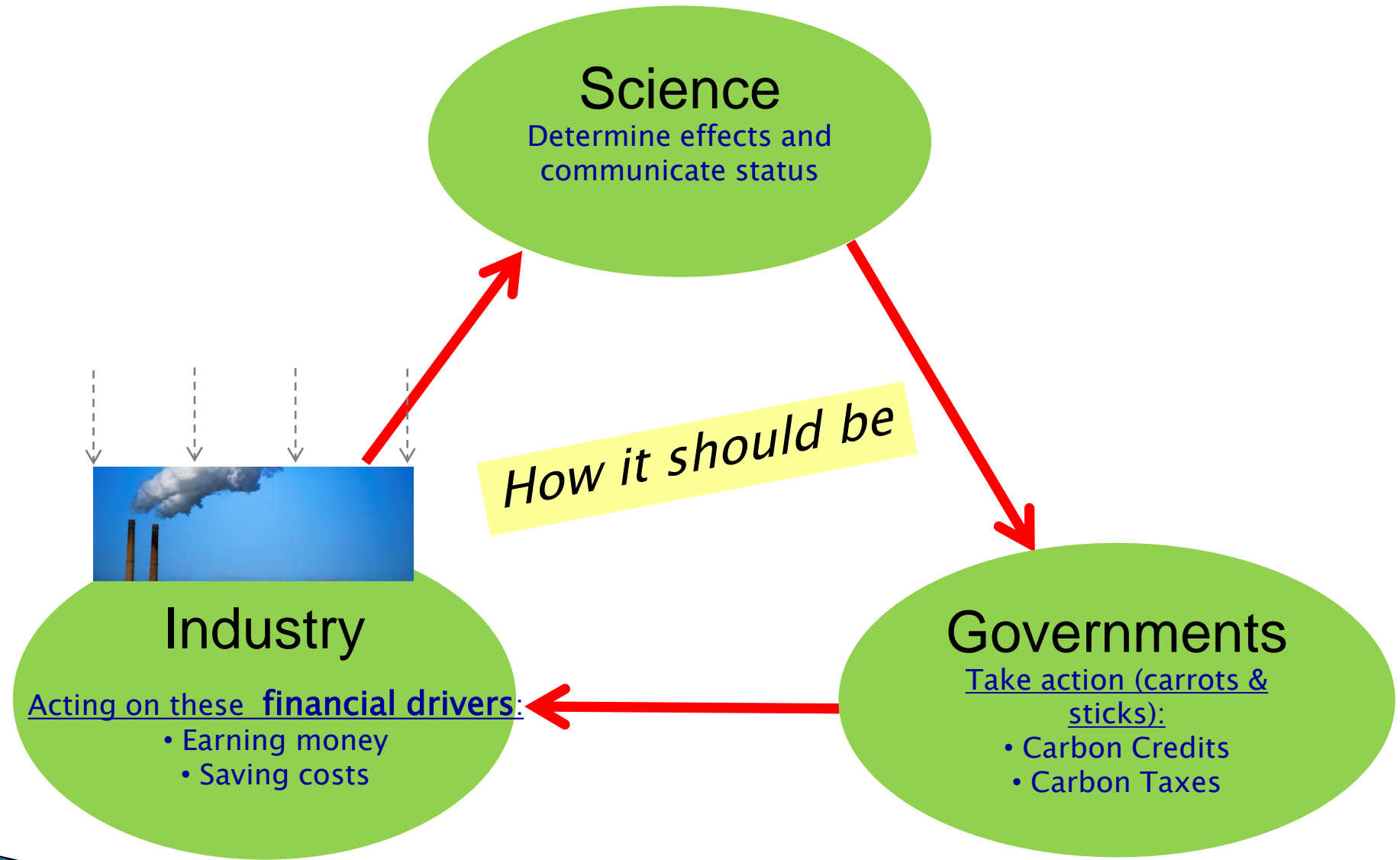
Dealing with the *climate change* issue (CO₂ and methane)



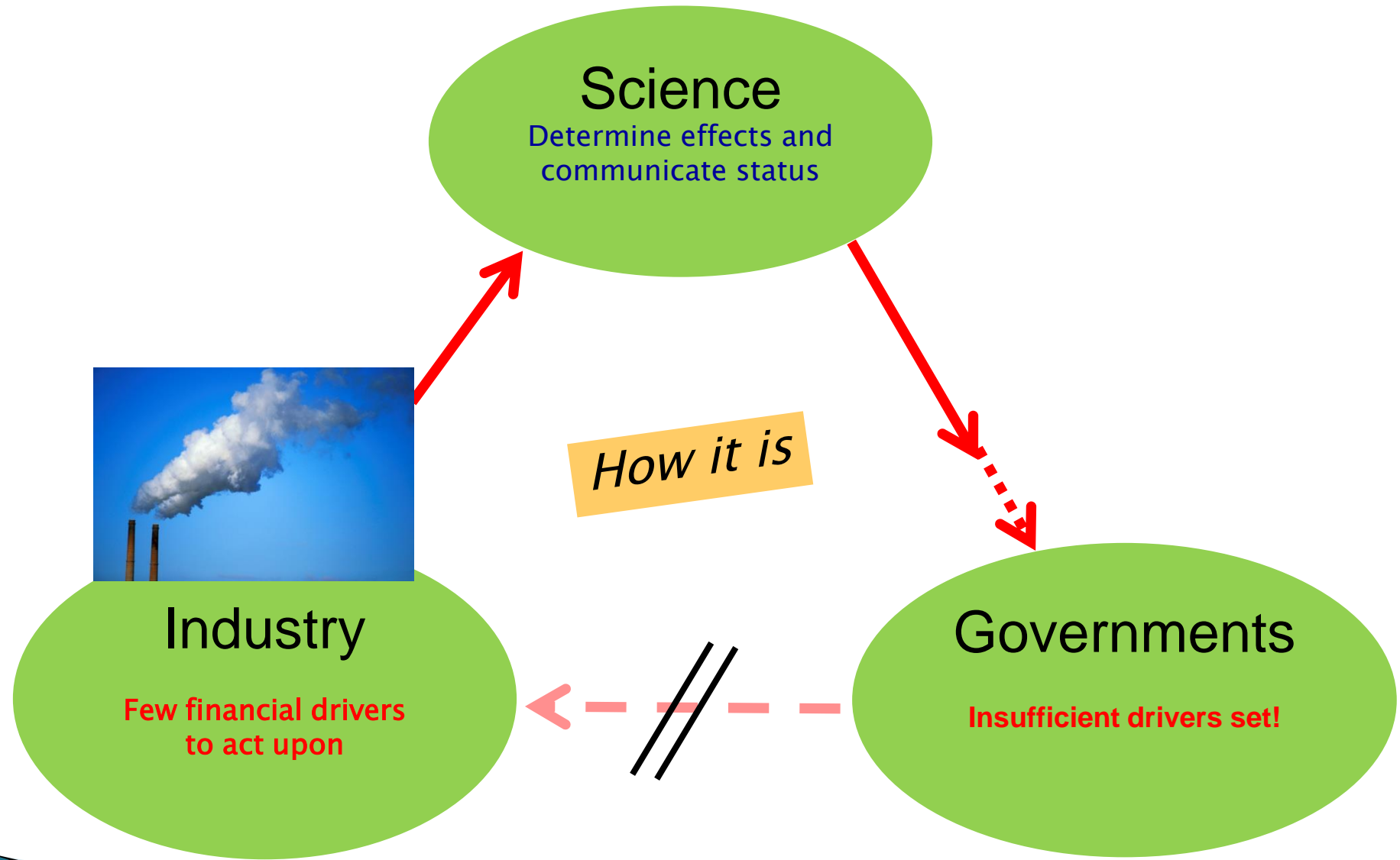
Dealing with the *climate change* issue (CO₂ and methane)



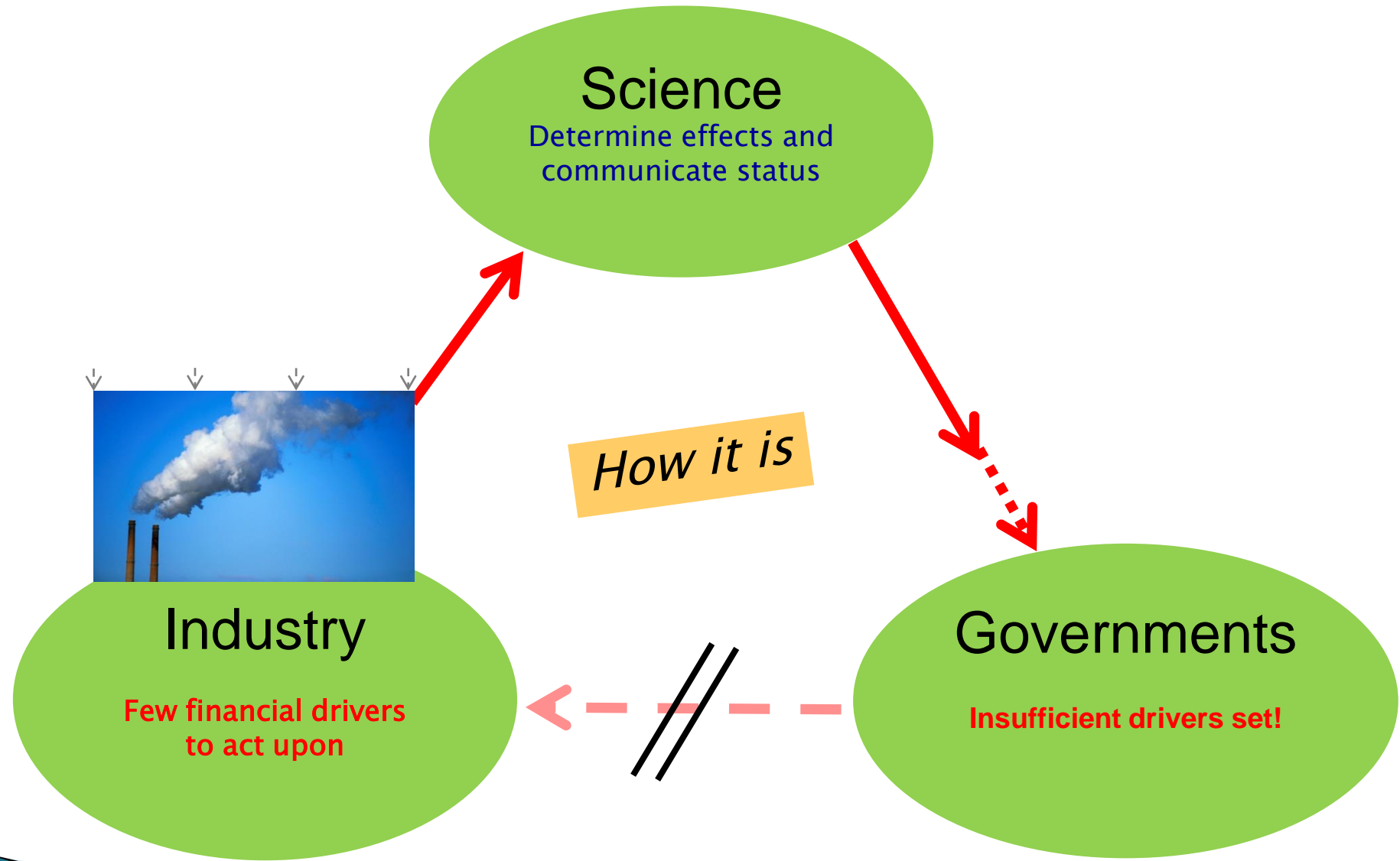
Dealing with the *climate change* issue (CO₂ and methane)



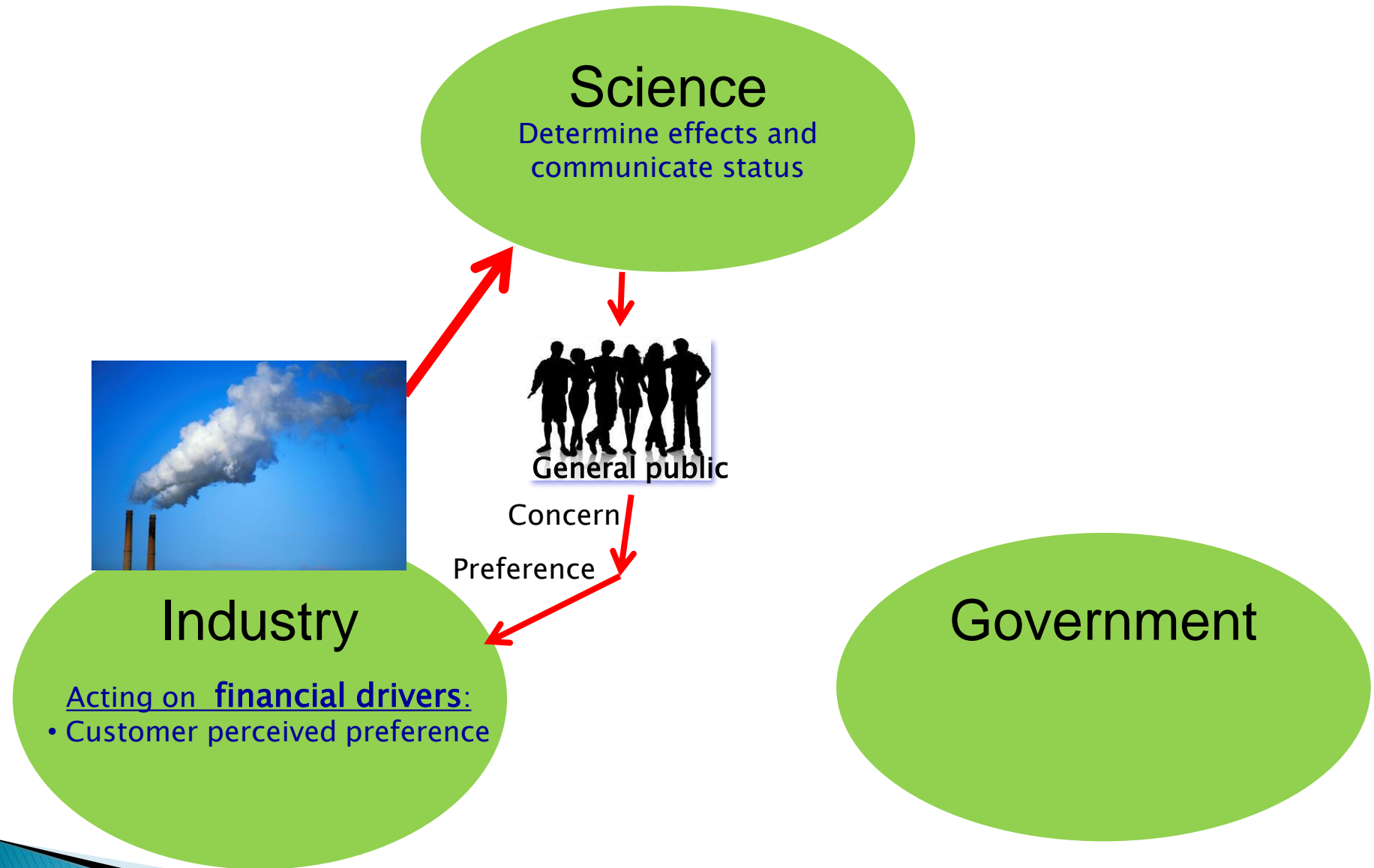
Dealing with the *climate change* issue (CO₂ and methane)



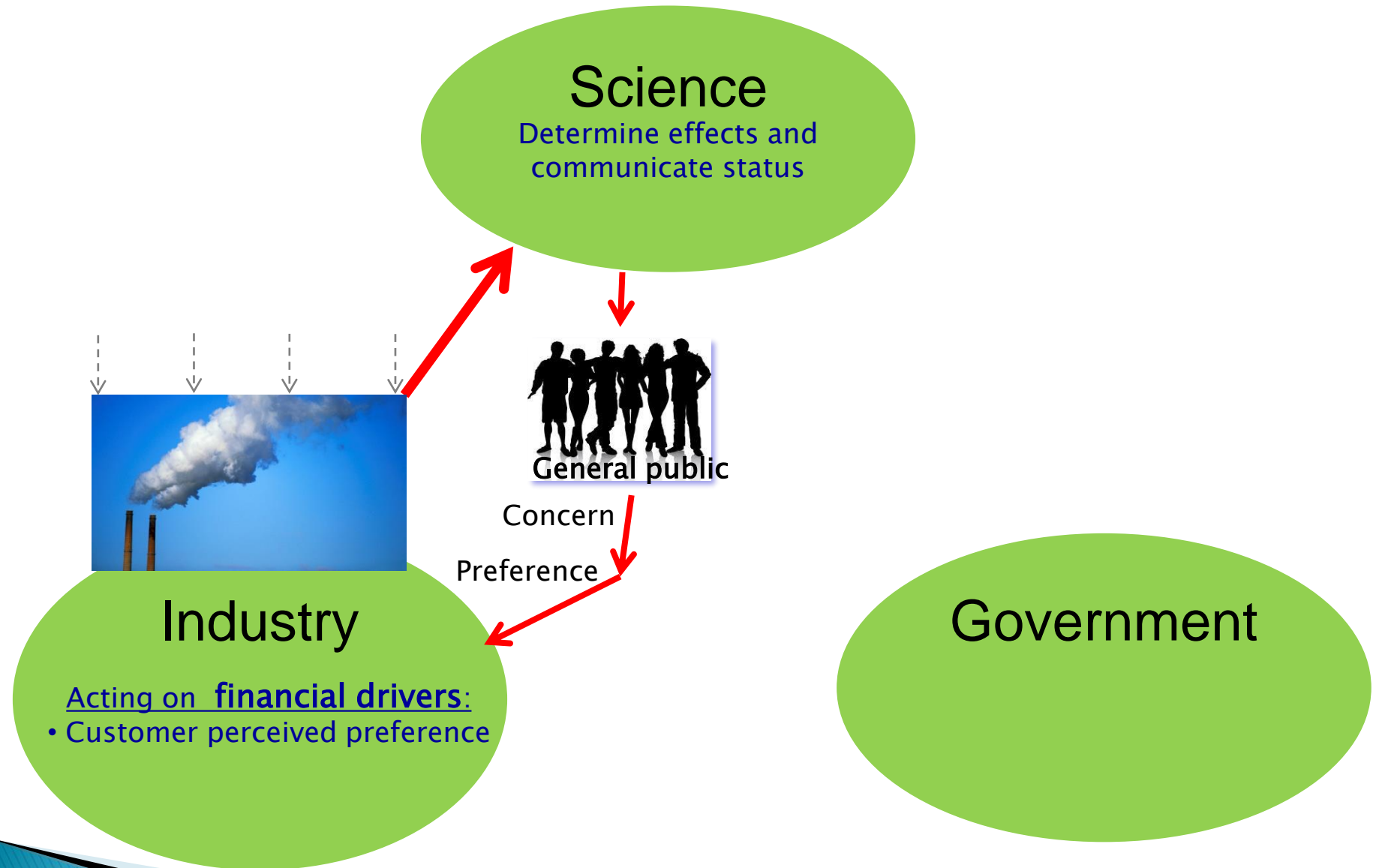
Dealing with the *climate change* issue (CO₂ and methane)



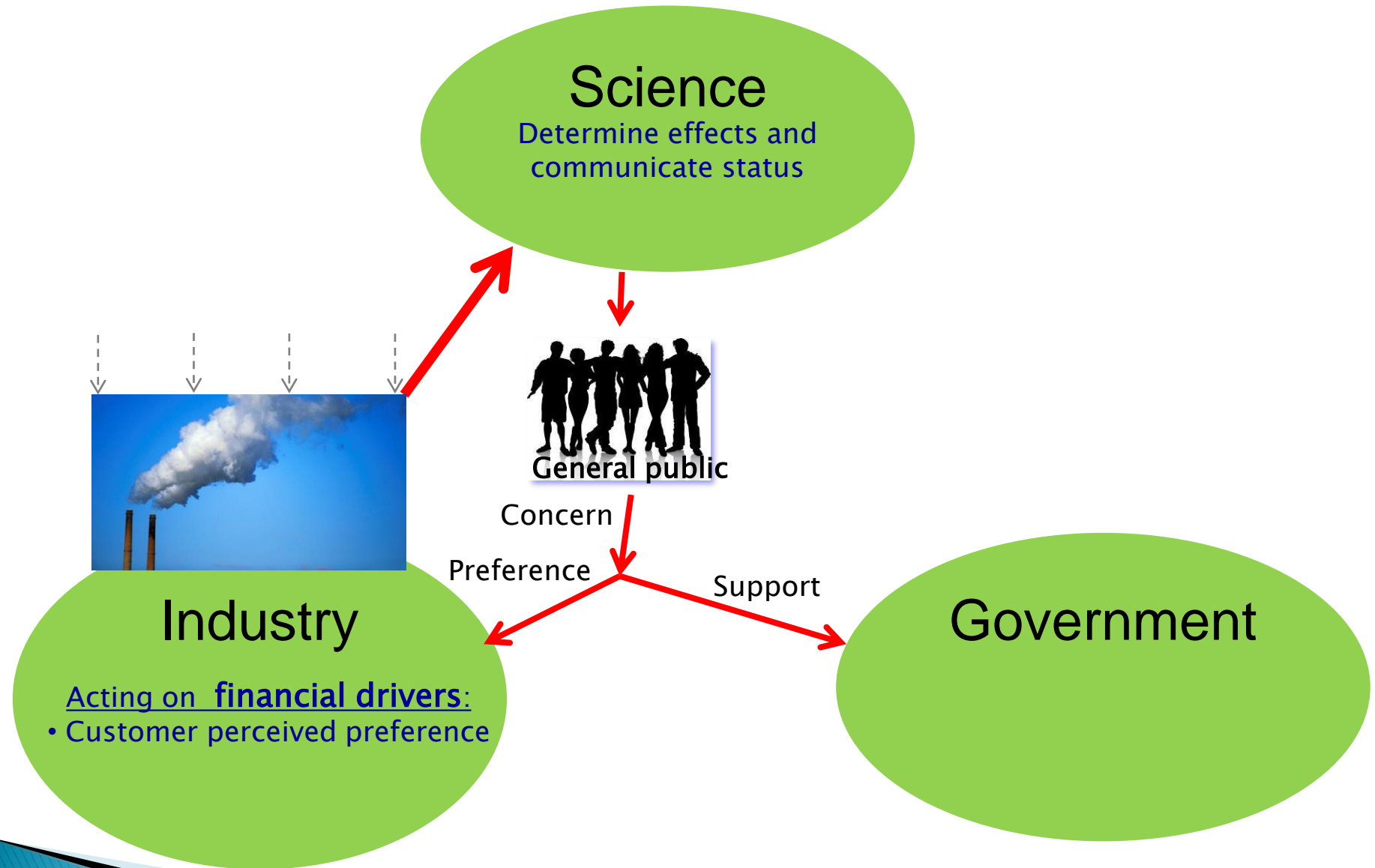
Dealing with the *climate change* issue (CO₂ and methane)



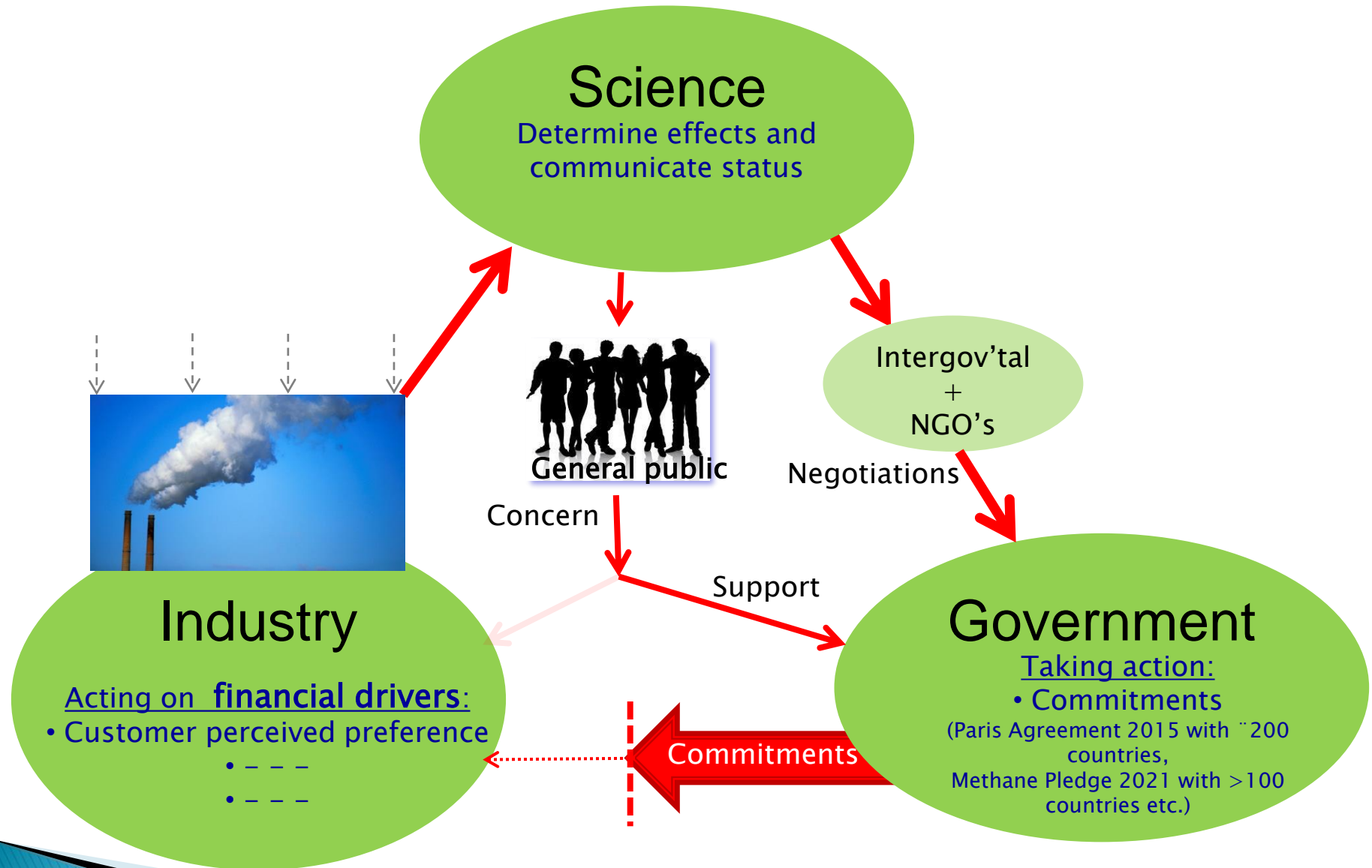
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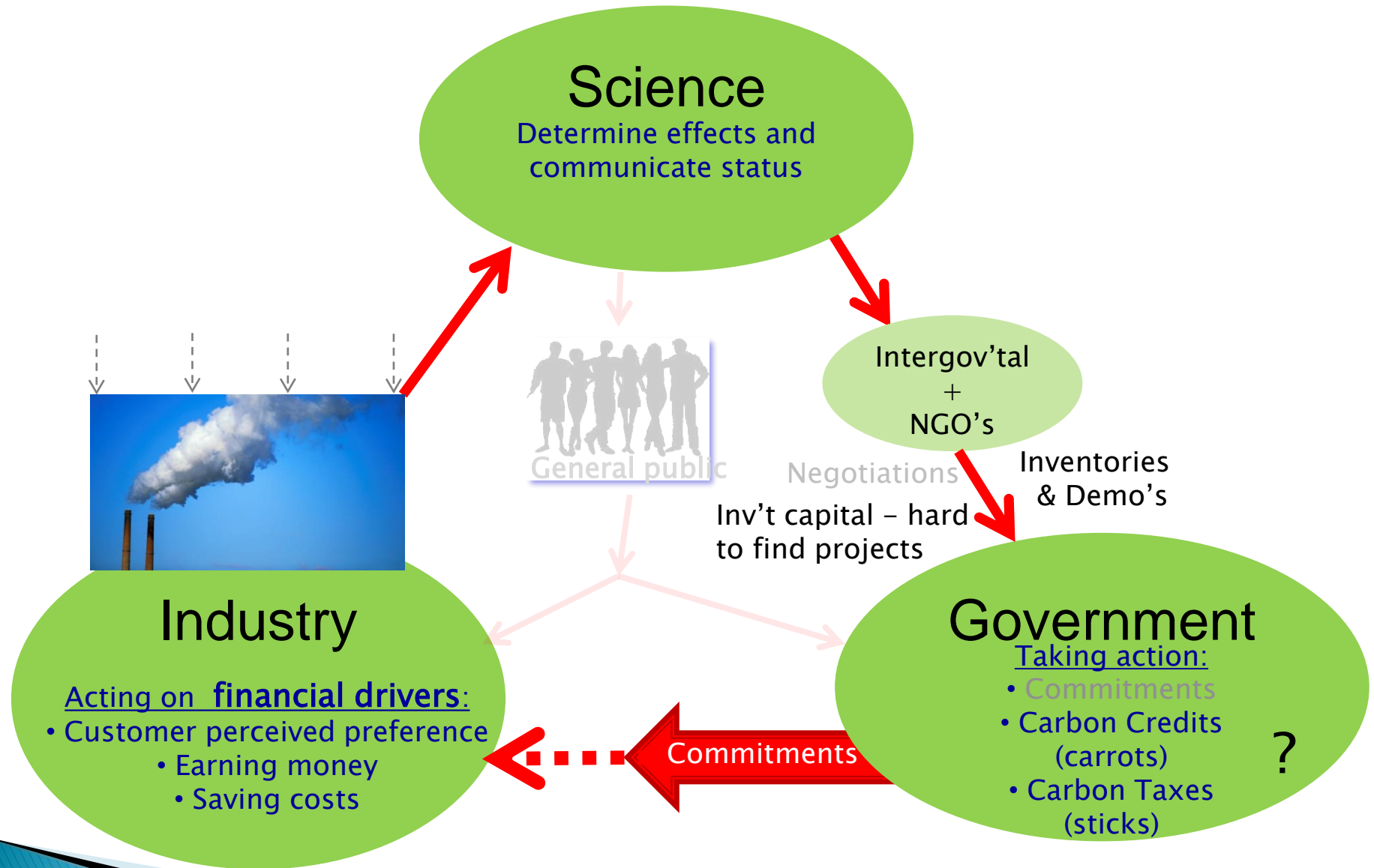
Dealing with the *climate change* issue (CO₂ and methane)



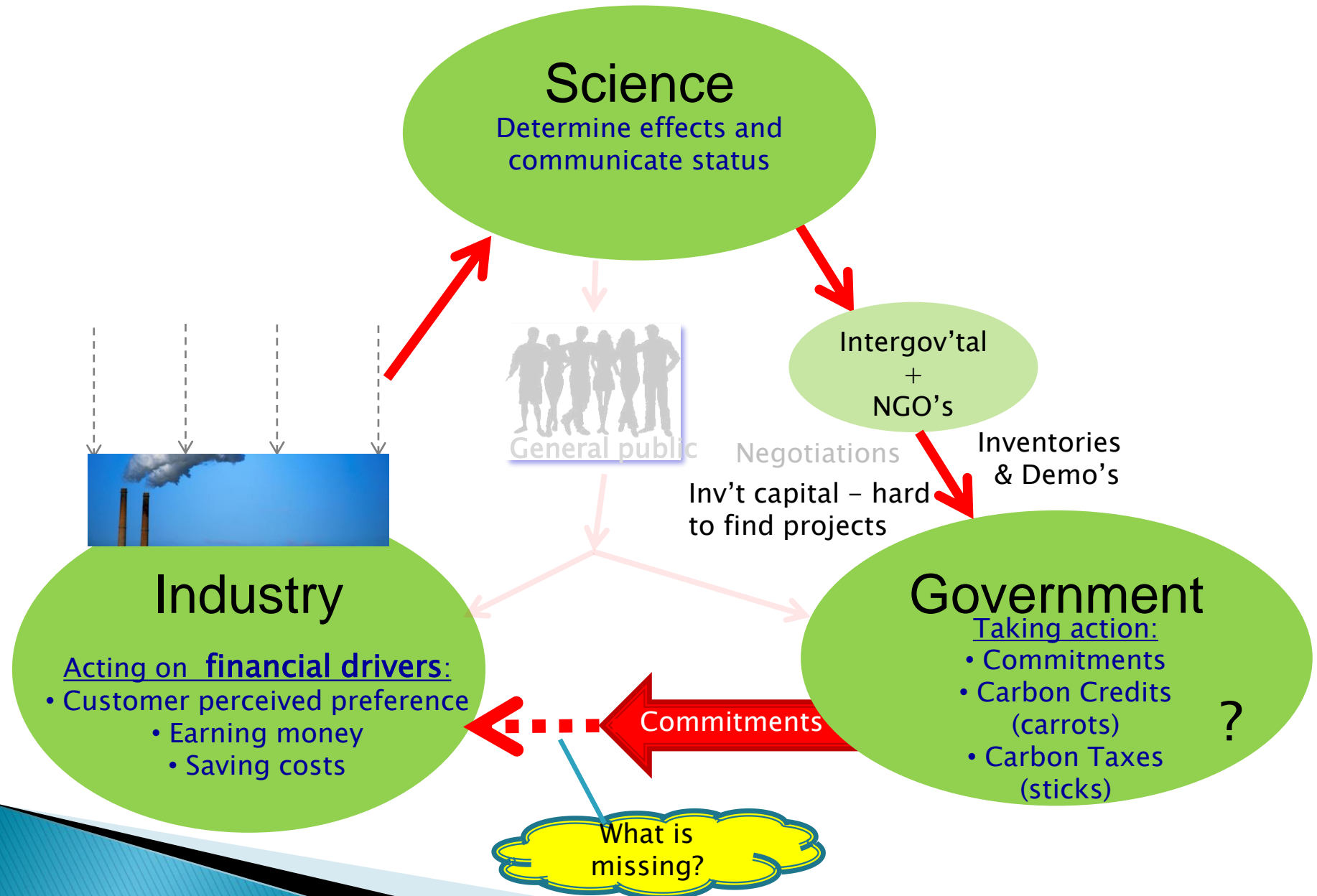
Dealing with the *climate change* issue (CO₂ and methane)



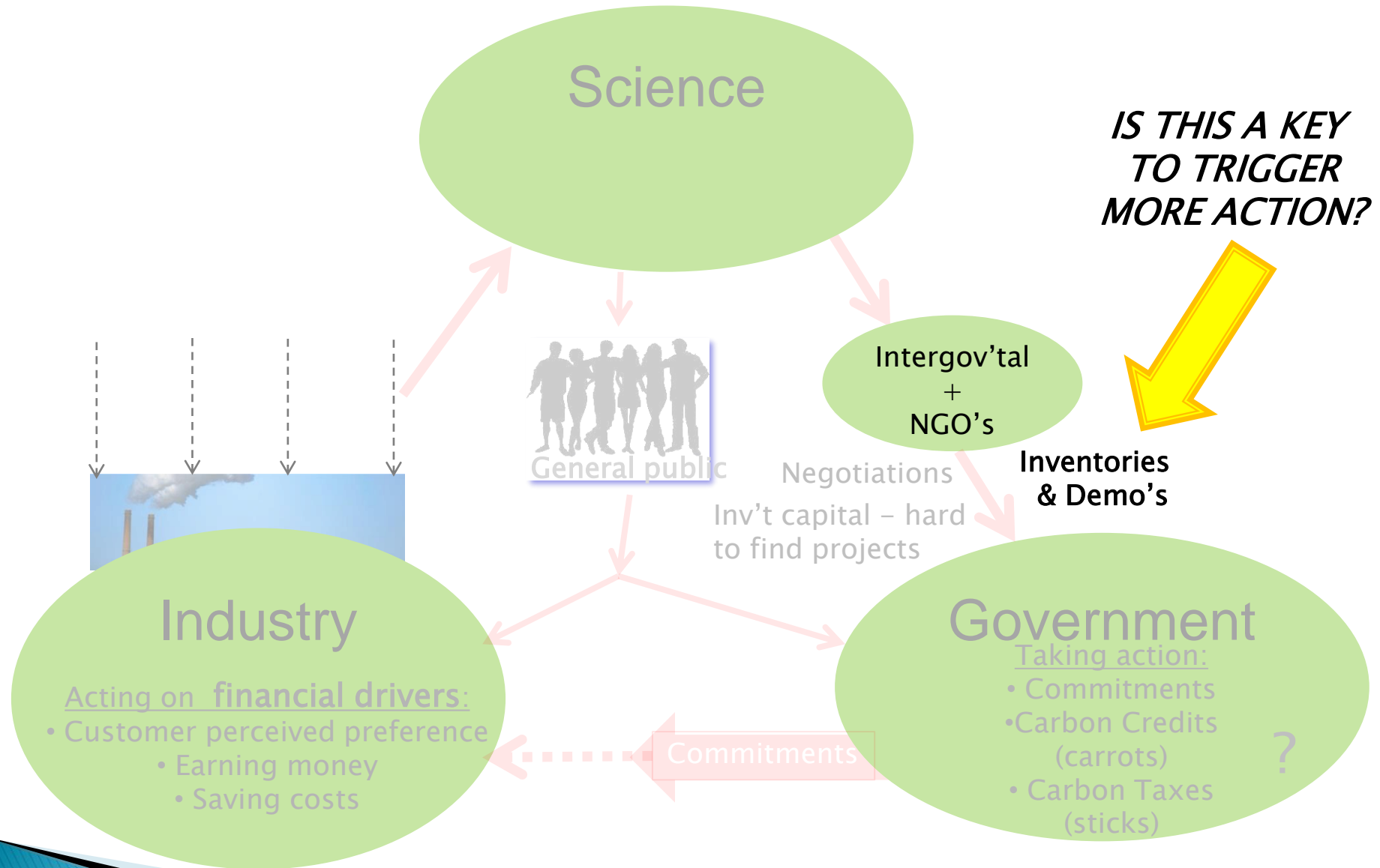
Dealing with the *climate change* issue (CO₂ and methane)



Dealing with the *climate change* issue (CO₂ and methane)

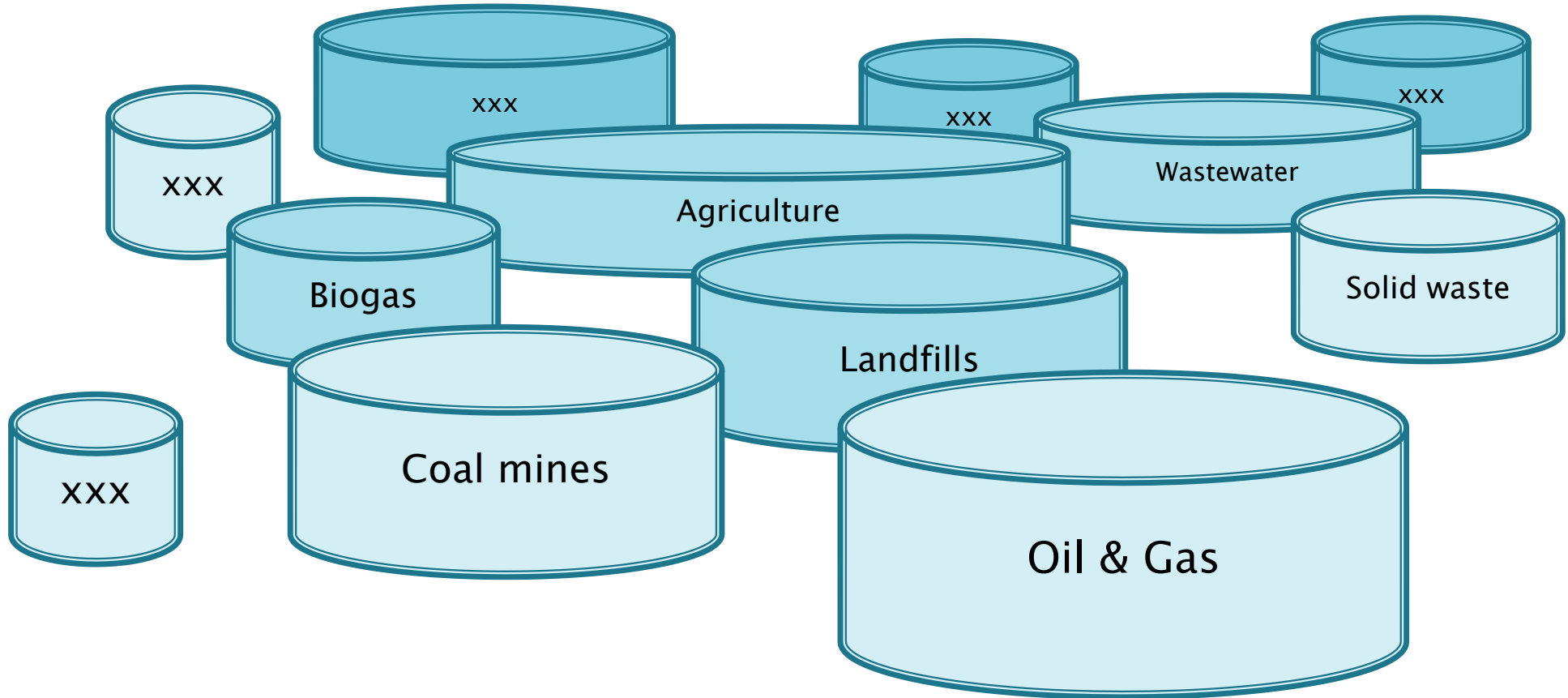


Dealing with the *climate change* issue (CO₂ and methane)



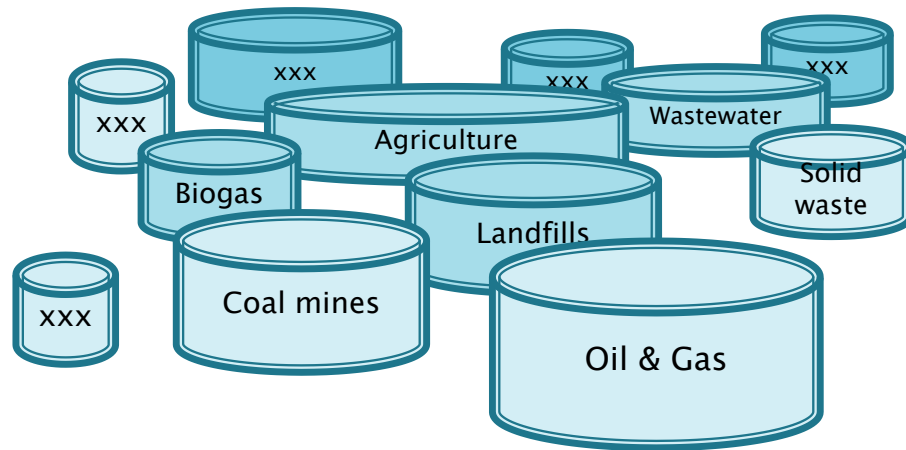
Dealing with the *climate change* issue – focus on methane

Methane emissions from different sectors



Dealing with the *climate change* issue – focus on methane

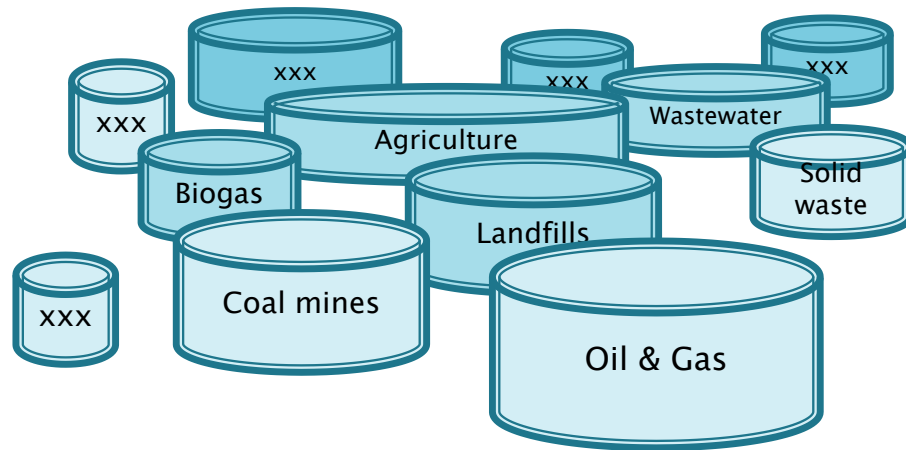
Methane emissions Inventories of emission sources and Technology demonstrations



- Has for 2 decades been focused on by:
 - GMI, Global Methane Initiative
 - Sustainable Energy Division, UNECE
- Created a "gold mine" of info on:
 - Comparative sizes of different emission sources.
 - Efficiencies of alternative emission reductions.
 - Proven and emerging technologies for the handling of large and small emissions from different emission sources.

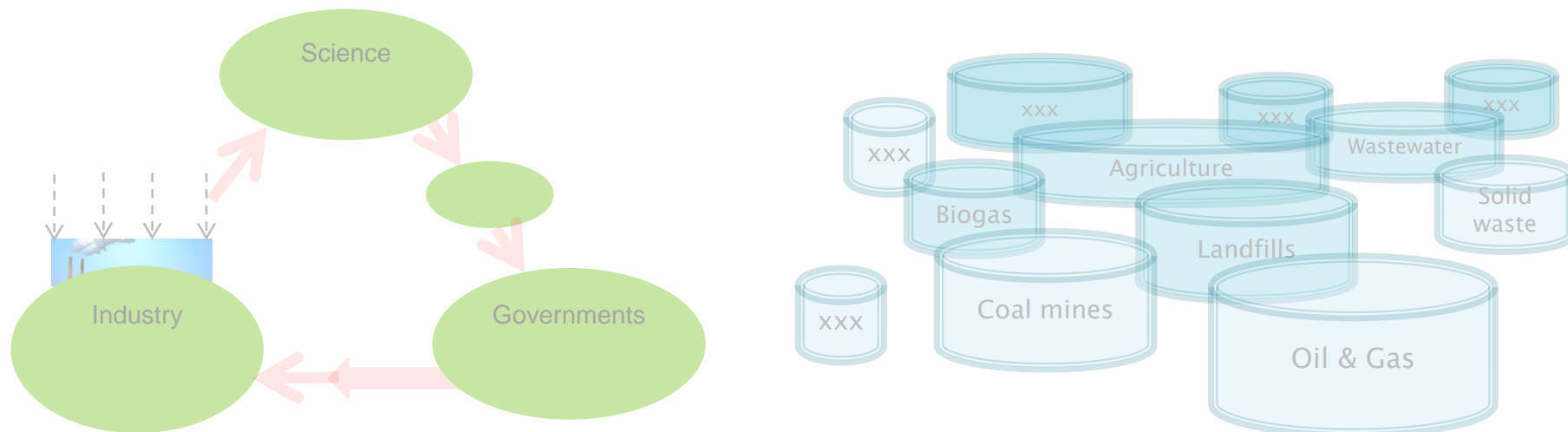
Dealing with the *climate change* issue – focus on methane

Methane emissions Inventories of emission sources and Technology demonstrations



- Has for 2 decades been focused on by:
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 - Created a "gold mine" of info on:
 - Comparative sizes of different emission sources.
 - Efficiencies of alternative emission reductions.
 - Proven and emerging technologies for the handling of large and small emissions from different emission sources.
- ➡
- Does it come across as a "jungle" of info, difficult to access for policy makers, politicians, financing, project developers etc.?

Dealing with the *climate change* issue – focus on methane



Pitch / Question

Is there, based on GMI and UNECE material,
and considering Governmental Commitments

(Paris Agreement, Methane Pledge etc),

an interest / need for a well structured
Guide on How to Reduce Methane Emissions?

If so, should it be targeted for non-technical
readers,
intended as a tool for making Road Maps?

THANK YOU

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Thank You

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Thank you!



ENERGY



Sustainable Energy Division
United Nations Economic Commission for Europe



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