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Technology and Policy Innovation to Support Sustainable Emissions Mitigation

Canadian Action on Global SLCP Emissions Reduction

Michael Layer

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UNEP CCAC Webinar

Canada

Canada's Climate Financing and Energy Innovation Programming

- Canada's Climate Financing and Energy Innovation Program are supporting bilateral collaboration to **implement Nationally Determined Contributions** for black carbon and methane reduction

- Strategic partner-country objectives include:

- Verifiable flaring, venting & fugitive emissions reduction
- MRV technologies and standards to support:
 - Accurate measurement-based emission factors
 - Jurisdictional carbon trading (ITMOs)
- **Identify high-impact** environmental, economic, energy and social **policy opportunities**
- **Unlock financing** for **high-impact emissions mitigation** (internal, market capital, patient green investments)



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Resource management vs. waste management approach to emissions mitigation

- Significant volumes of recoverable hydrocarbon commodities are lost to intentional venting and flaring, and unintentional fugitive emissions
- Venting of hydrocarbon commodities, in compliance with policy and regulations, become toxic and climate forcing VOC and GHG emissions
- Flaring of methane and VOC-rich natural gas, in compliance with policy and regulations, forms black carbon particles which are toxic and have a global warming impact hundreds of times greater than CO₂
- Disruptive innovation in technology and policy can identify currently overlooked opportunities for high-impact emissions mitigation



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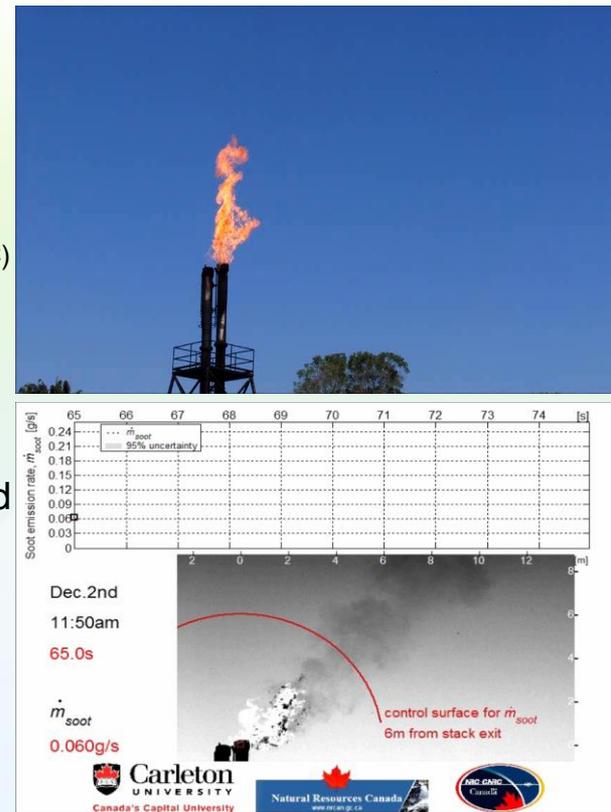
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Technology and knowledge to improve economic and environmental understanding

- Dr. Matthew Johnson et al developed and demonstrated field deployable optical technology (Sky-LOSA) to quantify instantaneous black carbon emission rates from unconfined atmospheric flare plumes
 - Carleton University, Natural Resources Canada (NRCan) and National Research Council (NRC)
 - <https://carleton.ca/eerl/journal-articles/> and 2015 presentation on CCAC website
- Sky-LOSA relies on line-of-sight-attenuation of skylight through a black carbon (BC) soot-laden flare plume:
 - Optical properties of BC soot & light scattering theory for aggregated particles, coupled with measured transmissivity of diffuse skylight through the plume, yields accurate BC concentration
 - Coupling accurate BC concentration with measured instantaneous two-dimensional plume velocity, allows calculation of instantaneous BC emissions rate



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Technology and knowledge identify cost effective, scalable and cross-cutting policy options

- **Compressor station flare in urban center (Population 195,000)**
- Soot emission rate: 0.067 ± 0.02 g/s
- Equivalent to emissions from **16** diesel buses continuously driving
- **What does it cost a municipal economy to retrofit or replace 16 city buses?**



- **Gas Plant Flare in Uzbekistan (2008 Clearstone/Carleton/GGFR collaboration)**
- Soot emission rate: 2.0 ± 0.66 g/s
- Equivalent to emissions from **500** diesel buses continuously driving
- **What does it cost a municipal economy to retrofit or replace 500 city buses?**
- **Science and policy integration can identify previously overlooked policy options to cost effectively achieve comparable environmental outcomes**



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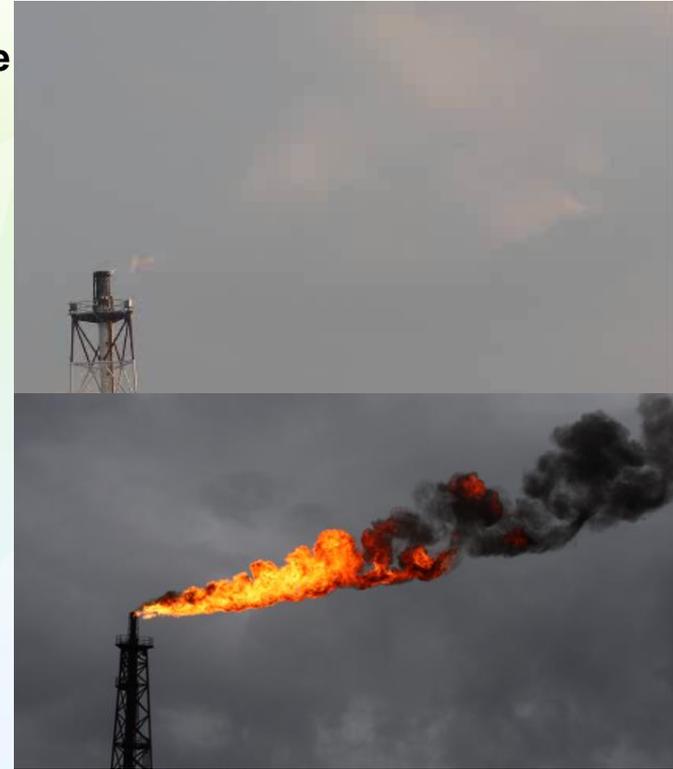
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Integrated policy and technology disruption to achieve better outcomes

Government and corporate **policies and available technologies determine AND sustain** economic, environmental & social performance

- Change to performance inertia requires disruptive policy and technology innovation
- **Compliance with existing policy** approach to emissions mitigation:
 - Optimization of steam-assist soot suppression system
 - 22 kt per year CO₂e emissions reductions
 - \$18.9 million USD per year avoidable energy costs
 - Potential to switch from steam to compressed air assist
 - 15.7 kt per year CO₂e emissions reductions
 - \$1.3 million USD per year avoidable energy costs
- **Resource management** based approach to emissions mitigation identified overlooked opportunities:
 - \$237 million USD per year avoidable hydrocarbon losses
 - 1.3 Mt per year CO₂e emission reduction



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Thank You!

For further information please contact:

Michael Layer

Clean Air and Energy Research (CAER) Program

Office of Energy Research and Development (OERD)

Natural Resources Canada (NRCan)

e-mail: michael.layer@Canada.ca

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