



# Gas flaring: An industry practice faces increasing global attention

Presentation to Arctic Council and Finland's black carbon event at COP24, Katowice, December 10, 2018

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*“Zero Routine  
Flaring by 2030”  
Initiative*



# Iraq

World Bank mission May 2016 (Photo: R. Lesnick, WB)



*It doesn't have to be this way...*



## Gas Flaring – Why Should It Stop?

### The large volumes

- About 141 billion cubic meters in 2017
- Enough to produce 750 billion kWh power
  - More than the entire power consumption on the African continent

### The CO<sub>2</sub> emissions

- About 350 million tons annually
- Equivalent to about 77 million cars

### The methane emissions

- Methane has a global warming potential (GWP) of **34**, i.e. trapping that many more times heat than same mass of CO<sub>2</sub> in a 100-year perspective. Methane has a GWP of **86** in a 20-year perspective (IPCC Fifth Assessment Report)
- Un-combusted methane is considered a major concern with flaring

### The black carbon emissions

- In and near the Arctic impacting the reflective power of the snow and ice cap (albedo)

...and health impacts when people live near flares (Photo from the Niger Delta)

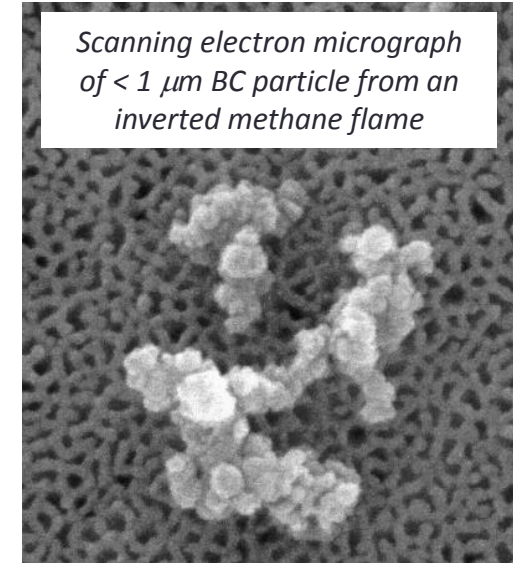




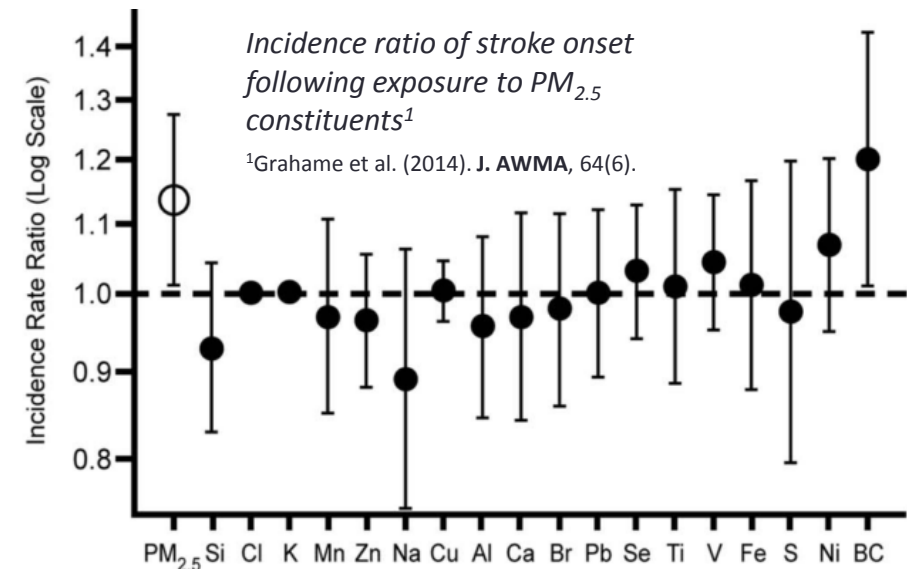
## Black Carbon (BC) in a nutshell

- Black carbon is the strongly absorbing carbonaceous component of combustion-generated soot
  - Formed through incomplete combustion of fossil fuels, biofuel and biomass
- Second most important climate forcer after CO<sub>2</sub>
  - Climate effects are dependent on location but very strong overall
  - Heightened impacts in the Arctic
- Very short atmospheric lifetime (order of weeks)
  - Quick environmental payback on mitigation
- Critical air quality and health impacts
  - BC is a component of fine particulate matter (PM<sub>2.5</sub>)
  - Causal link with lung cancer and cardiovascular mortality

(e.g. Grahame et al., 2014)

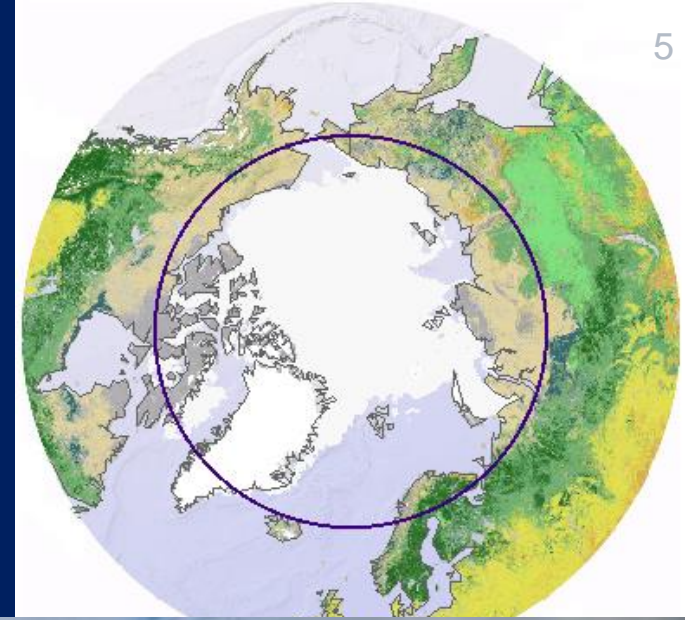


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## BLACK CARBON



### Research:

- 40% or more of **black carbon** /soot deposition in the Arctic is from flaring (*Stohl et al., 2013*)
- Reduces the reflectivity of Arctic snow and ice and speeds melting



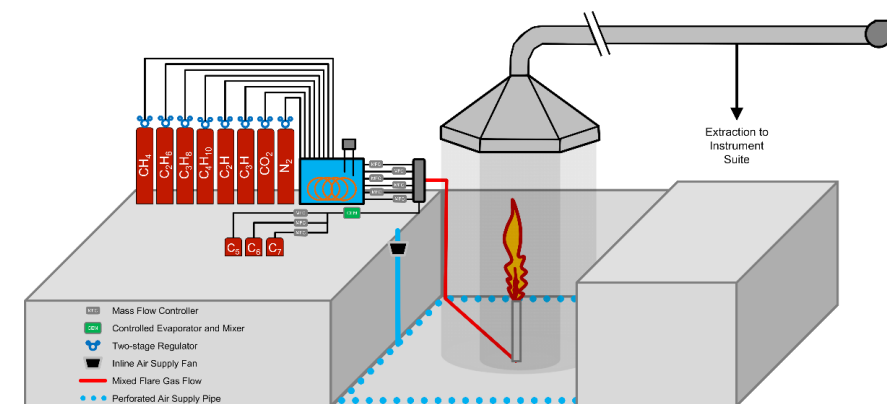


## Black carbon from flares – impact on the Arctic snow and ice cap may be worse than anticipated

Controlled experiments at Carleton University<sup>1</sup>, Canada, suggest that light absorption (climate impact) of flare BC is:

- Different (higher) than BC from other sources
- Sensitive to flare gas composition and flow rate
- Predictable based on available flare gas metrics and operational conditions

New model<sup>1</sup> suggests climate forcing potential from flare BC is at least 1.5-2 times higher than standard value<sup>2</sup> for other BC sources



<sup>1</sup>Conrad & Johnson (2018). Carbon, under review.

<sup>2</sup>Bond & Bergstrom (2006). Aer. Sci & Tech., 40(1).





## How to eliminate BC from flaring at oil production sites?

Eliminate the entire routine flaring!

- Safety- and non-routine flaring are more difficult to avoid, but should be minimized
- Routine flaring defined:
  - Routine flaring of gas is flaring during normal oil production operations in the absence of sufficient facilities or amenable geology to re-inject the produced gas, utilize it on-site, or dispatch it to a market.

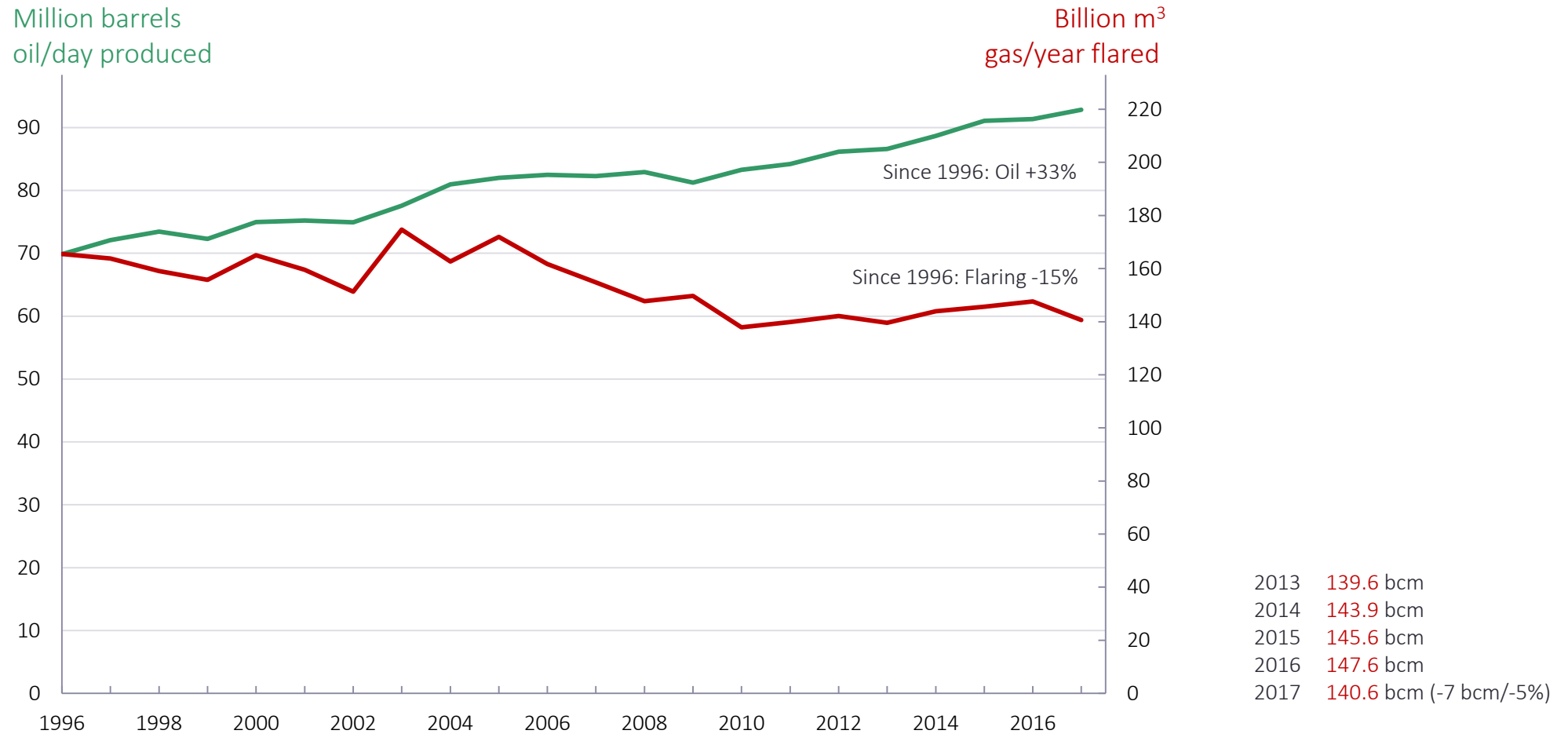
BC is mostly caused by incomplete combustion of heavier components in the flare (propane, butane, pentane). Should we extract them from flares?

- That still leaves a CO<sub>2</sub> emission problem
  - ...combusting the light gases methane and possibly ethane
- ...and causes poor resource management

Tailwind from Amended Gothenburg Protocol?

- First legally binding instrument to include a focus on black carbon as both a component of particulate matter and as an aerosol

# Global gas flaring – welcome downturn in 2017 – but new efforts needed







## Global Initiative: “Zero Routine Flaring by 2030”

### *The essence*

#### *Oil companies*

- **New oil fields:** Make development plans with zero routine flaring
- **Existing oil fields:** Seek economically viable solution to end routine flaring as soon as possible and no later than 2030

#### *Governments*

- **New oil fields:** Require development plans with zero routine flaring
- **Existing oil fields:** Make every effort to end legacy flaring as soon as possible and no later than 2030
- **Policies:** Provide legal/regulatory/investment/operating environment conducive to upstream investments and the development of energy infrastructure and markets

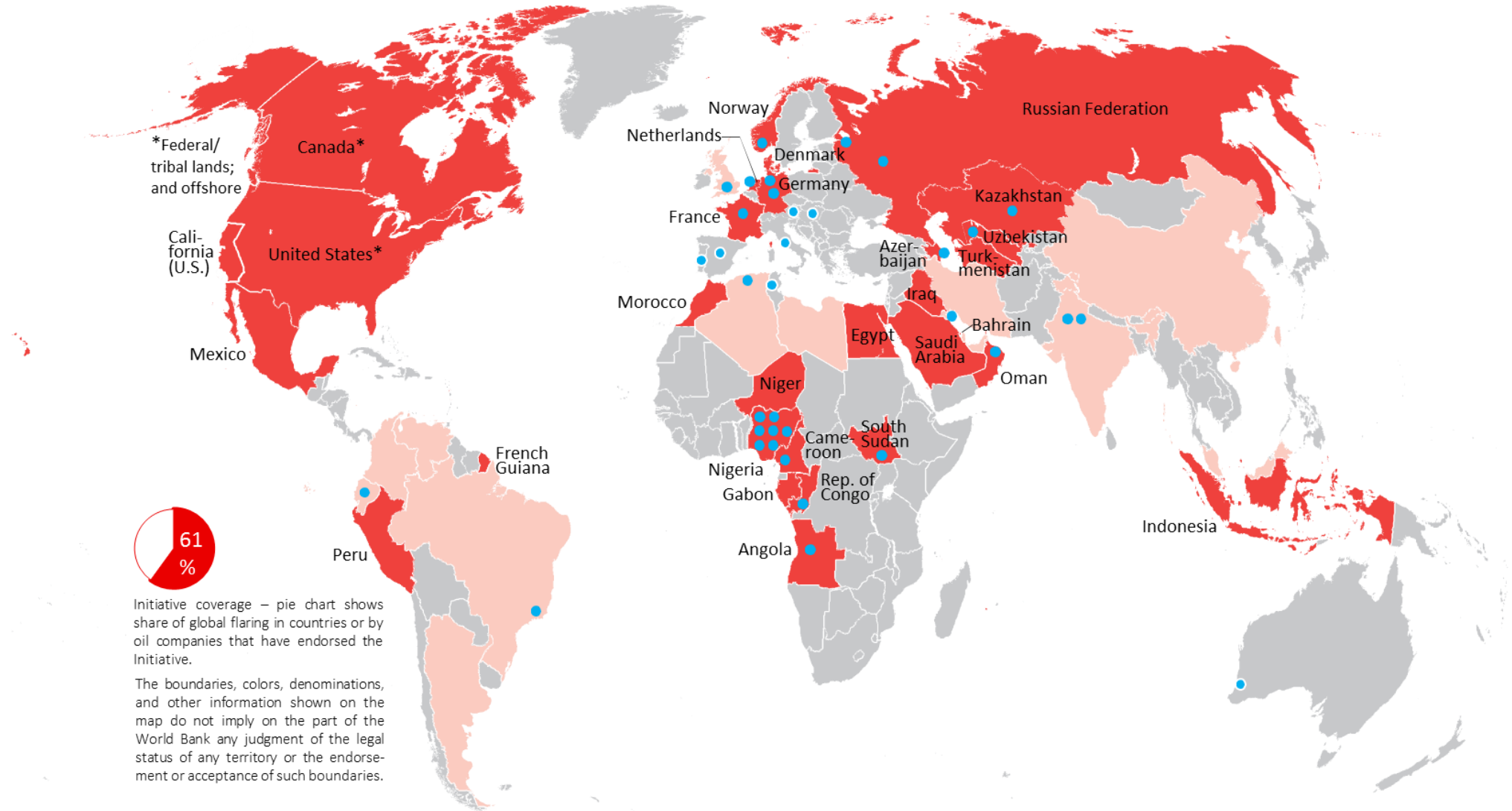
#### *Development institutions*

- Facilitate cooperation and implementation
- Consider the use of financial instruments and other measures



# “Zero Routine Flaring by 2030” Endorser Map (80)

- Endorsing country/government (29)
- Other country with oil production > 0.5 million barrels/day
- Endorsing oil company (36)
- Endorsing development institution (15) (not shown on map)





## End remarks

Black carbon emissions from gas flaring at oil production sites is a major global climate problem

- Heightened impacts in the Arctic where deposition on snow and ice speeds melting
- The climate forcing potential of flare BC likely higher than previously understood (*Conrad & Johnson, Carleton University, Canada*)

The solution is to avoid routine flaring in new oil fields and to address the ongoing legacy flaring

- The World Bank-led “Zero Routine Flaring by 2030” Initiative has the potential to ensure and hasten the end of global routine flaring

The Arctic Council’s engagement on black carbon is important

Finland’s sustained interest is welcome

- The World Bank appreciates Finland's upcoming membership in the Global Gas Flaring Reduction Partnership (GGFR) (from December 2018)





*Thank you*

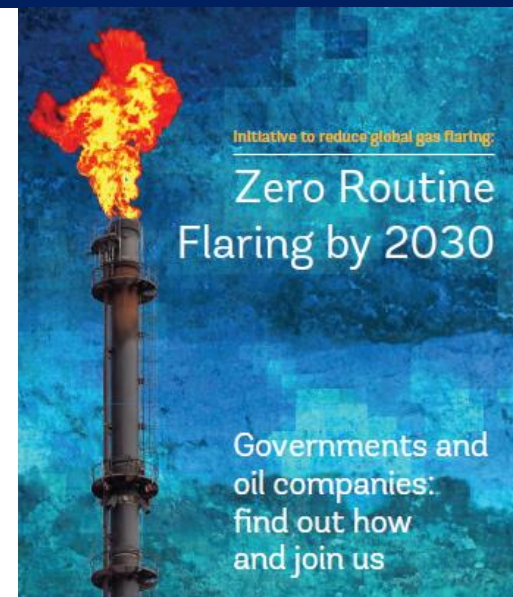


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[www.worldbank.org/ggfr](http://www.worldbank.org/ggfr)

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