Emissions accounting for CO_2-EOR

Paul Zakkour

Carbon Counts

7th IEA CCS Regulators Network Meeting, Paris, 23.04.2015

CARBON COUNTS

What we often hear about CO_2-EOR

The good

- It's a "win-win" solution for the climate
- It can offset the costs of CCS
- It can lead to long-term emission reductions
- It substitutes other sources of potentially more emission intensive oil supply

The bad

- It uses climate finance to encourage more fossil fuel production
- It diverts these resources away from renewables
- It can never reduce emissions as it produces more oil

CARBON COUNTS

How can we address these questions?

- Greenhouse gas emission accounting
  - Provides an objective basis for measuring **net** CO_2 emission reductions arising from operations
- Accounting issues for EOR:
  - Site level emissions
  - Subsurface monitoring
  - Incrementally produced crude oil

How can we account?

Life cycle analysis

- *Ex ante* estimate of full chain emissions
- Usually based on scenarios and estimates
- Boundaries and assumptions are critical factors
- Rubbish in, rubbish out

Measurement, reporting and verification (MRV or MMV)

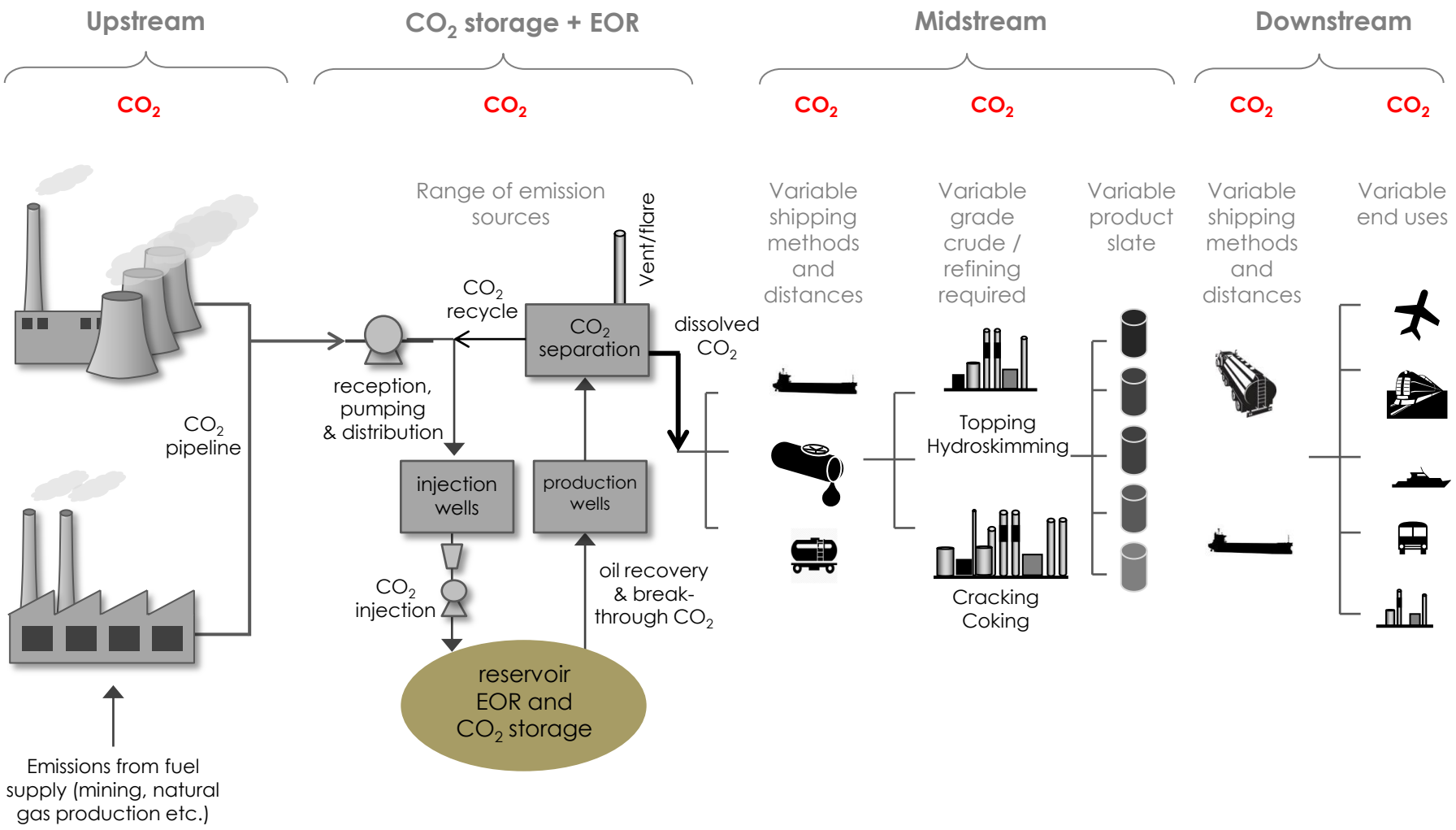
- *Ex post* measurement of emissions
- Based on performance of actual operations
- Boundaries and measurement approach determined by scheme rules

Both approaches are relevant:

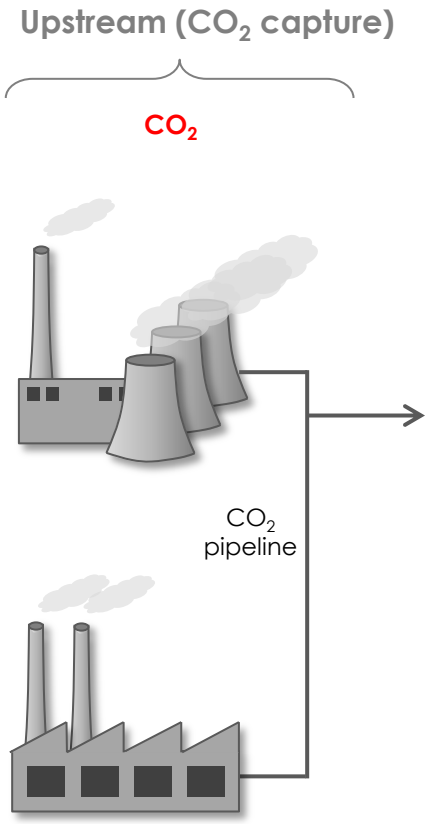
- LCA can reveal whether CO_2-EOR delivers net emission reductions, and therefore validity as an emission reduction technology
- Can be useful for e.g. EIA of projects

- MRV provides guidance and rules in order to measure effectiveness of GHG policies and targets
- Essential part of carbon price incentives e.g. C-Tax or ETSs

What needs to be measured?



Upstream emissions/reductions

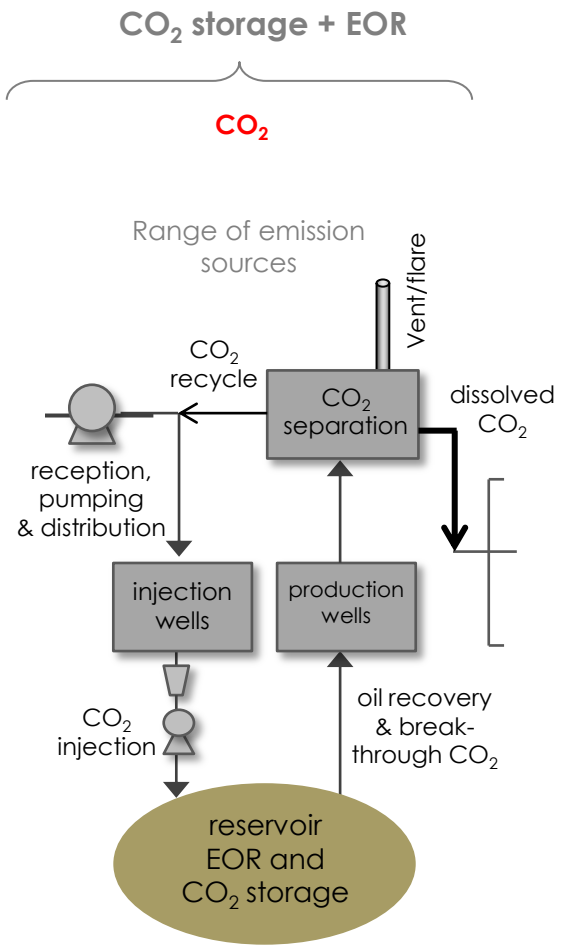


- Most GHG regulations allow captured and exported CO_2 to be deducted from facility GHG inventory (e.g. IPCC, EU ETS, GHGRP etc.)
- Provides the basis for carbon price incentives for CCS and CO_2-EOR

NO ISSUES HERE

CARBON COUNTS

Site-level emissions



- All GHG policies supporting CCS require monitoring of storage site emissions (e.g. IPCC, EU ETS, GHGRP etc.). Including CO_2-EOR:
  - Surface energy use
  - Vents, flares and other fugitives
  - Reservoir seepage monitoring
- Emissions added to overall CCS inventory to give **net** reductions within scheme boundary

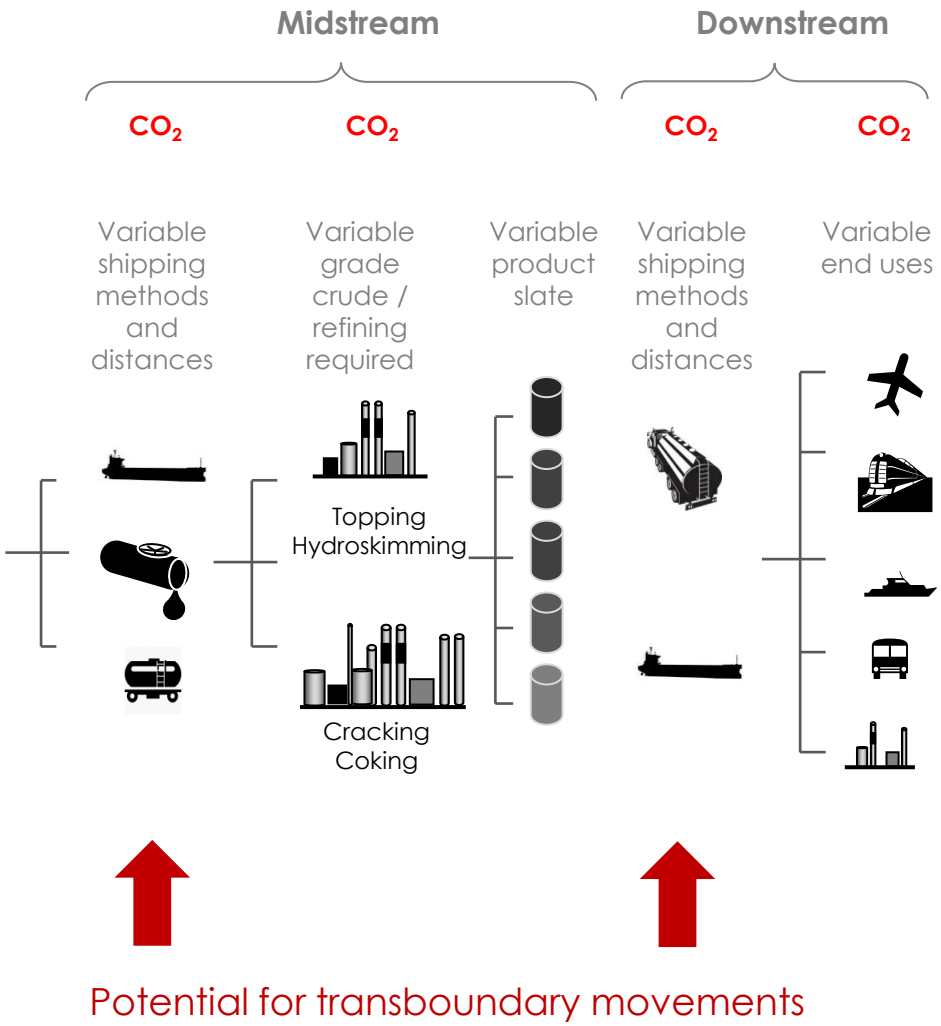
NO ISSUES HERE

CARBON COUNTS

Mid- and downstream emissions

- These emissions may or may not fall within scheme boundary
- Depends on movement of crude oil across borders ➔ ***Emissions Leakage***

ISSUES HERE



Emissions leakage

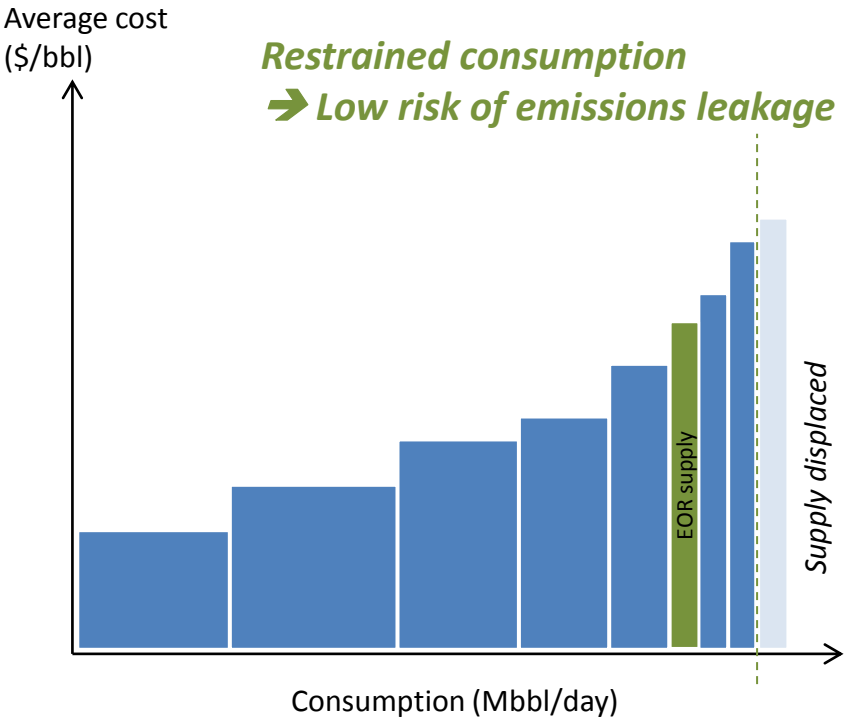
- Defined as:
  - *"potential for net changes in emissions to occur outside the boundaries and operational control of a particular policy and/or activity, but arising as a consequence of the policy and/or activity"*
- Scope to affect environmental integrity of scheme incentivising CO_2 storage via EOR
- Risk where asymmetry in GHG policies and measures (PAMs) between

  (a) where capture and EOR occurs; and

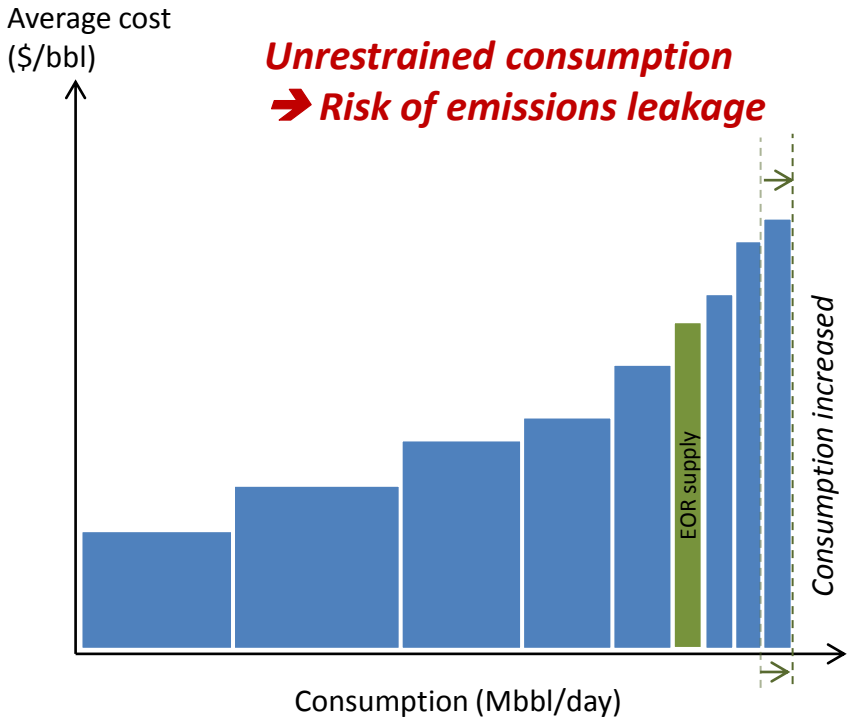
  (b) where crude is refined and used

Nature of leakage risk

Substitution



Addition



GHG PAMs can indicate risk of leakage

Low risk

- Refining subject to emission controls e.g. EU ETS, GHGRP
- End-use subject to constraints e.g.
  - Portfolio standards for vehicles
  - Portfolio standards for fuel suppliers
  - Aviation sector controls

➔ **Substitution**

High risk

- Weak policies and/ or no controls in place
- Scope for unconstrained increase in fossil fuel use
- Subsidies on fossil fuel consumption can actually encourage growth

➔ **Addition**

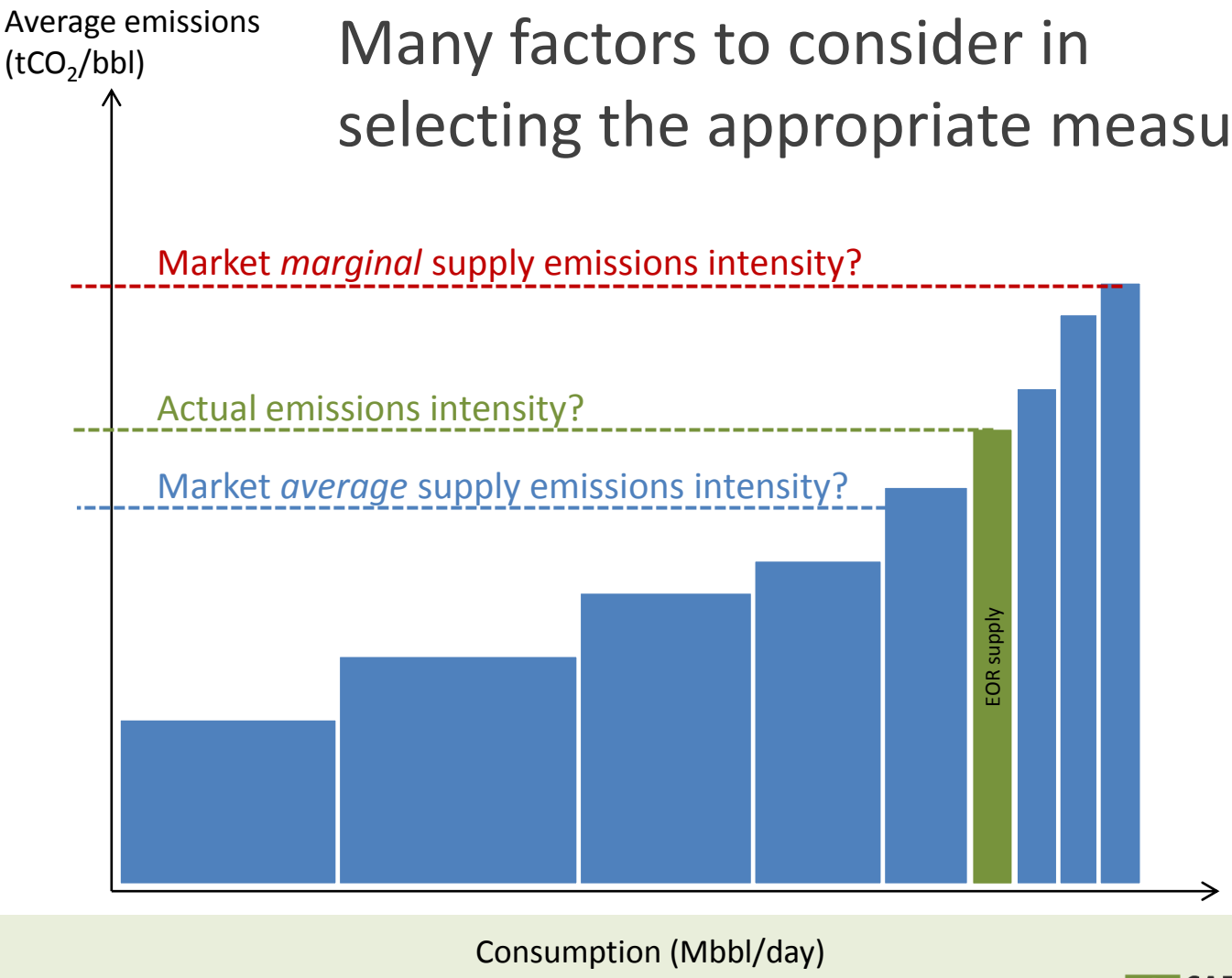
But not the perfect measure of risk

- Wide range of other factors at play:
  - Oil price dynamics
  - Subsidies on production and consumption
  - Political interventions e.g. quotas, etc.
- Variations in stringency of GHG PAMs:
  - Variation in Kyoto Protocol and INDC “targets”
  - Variations in national PAMs e.g.

    EU vehicle std: 130 gCO_2/km (2014) ➔ 95/gCO_2 km (2020)

    US vehicle std: 140 gCO_2/km (2016) ➔ 113/gCO_2 km (2020)

Leakage effect also difficult to measure



CARBON COUNTS

Discussion of these issues forthcoming in IEA GHG report:

Paul Zakkour
Director, Carbon Counts
E: paul.zakkour@carbon-counts.com
W: www.carbon-counts.com
T: +44 20 8870 3330 / +44 20 3603 8146 / +44 7834 161016

CARBON COUNTS