

# Whole of life CSG greenhouse emissions

## Multi-Regional Input Output Analysis

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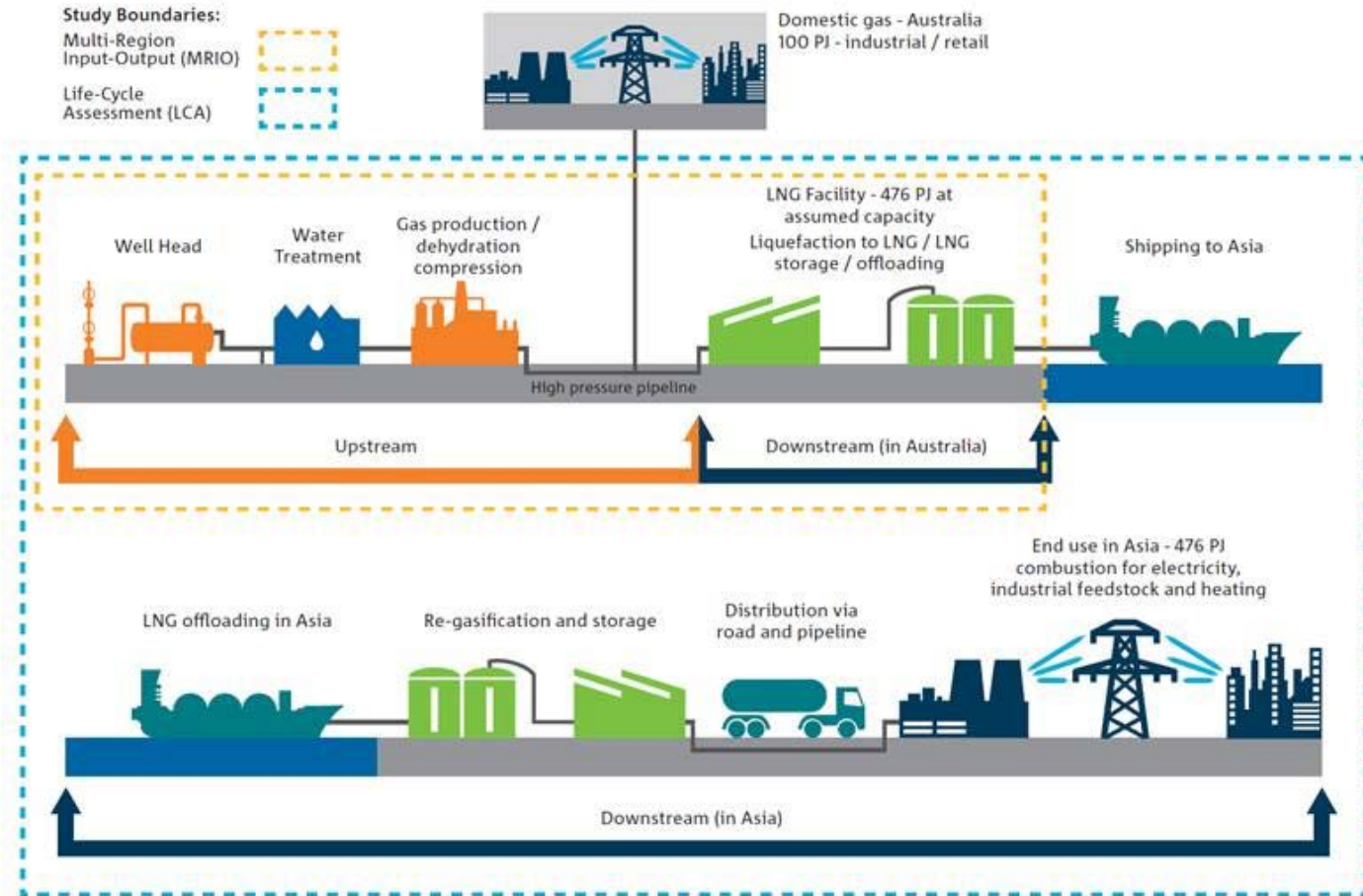
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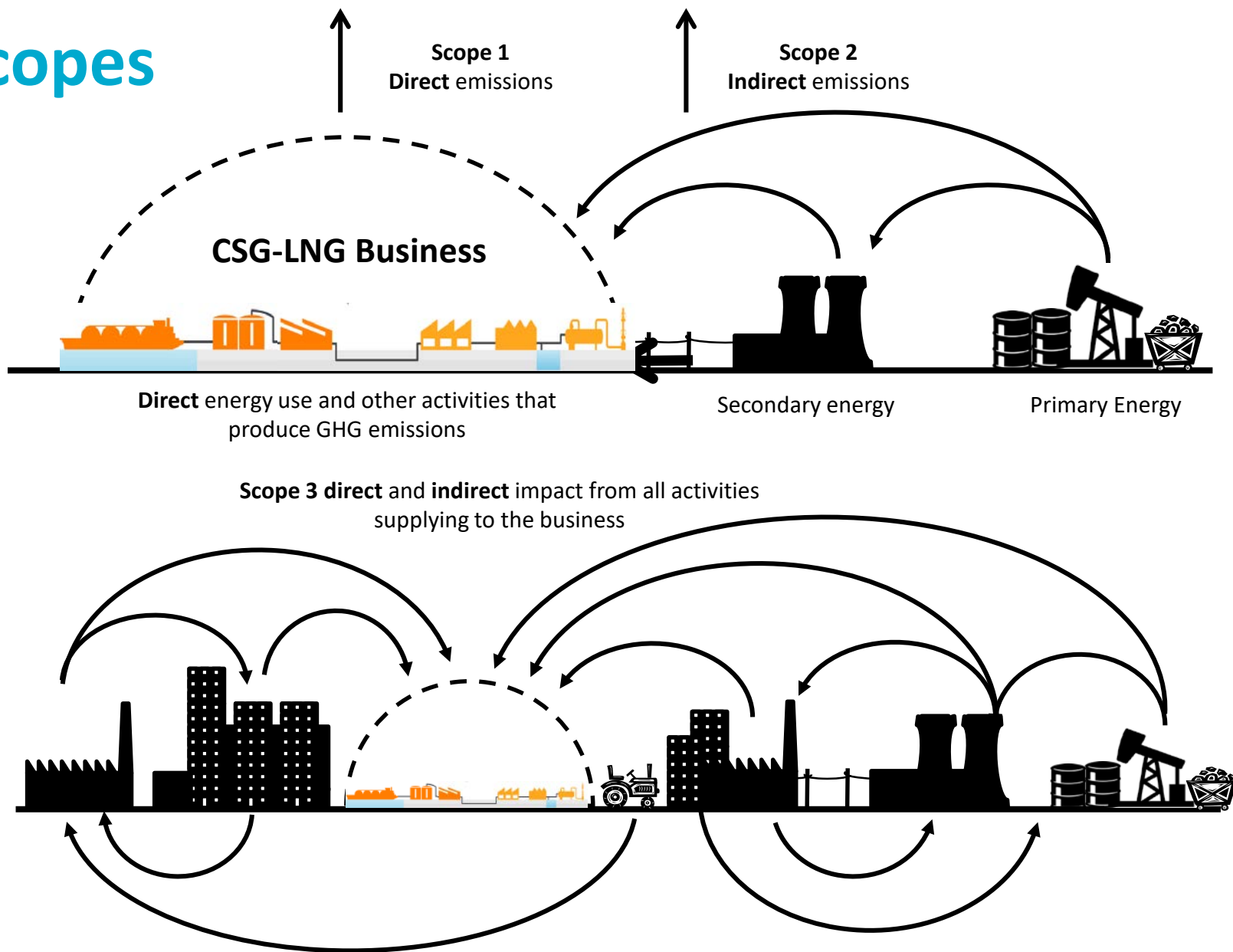
# Purpose

- A GHG footprint of the whole CSG-LNG business in Surat Basin
- A breakdown of emissions by Scope 1, 2, 3 including complete representation of supply chains to the CSG-LNG business
- Outer scope and direction to more detailed LCA
- Perspective on the relative importance of fugitive emissions

# Scope: Study Boundary



# Scopes



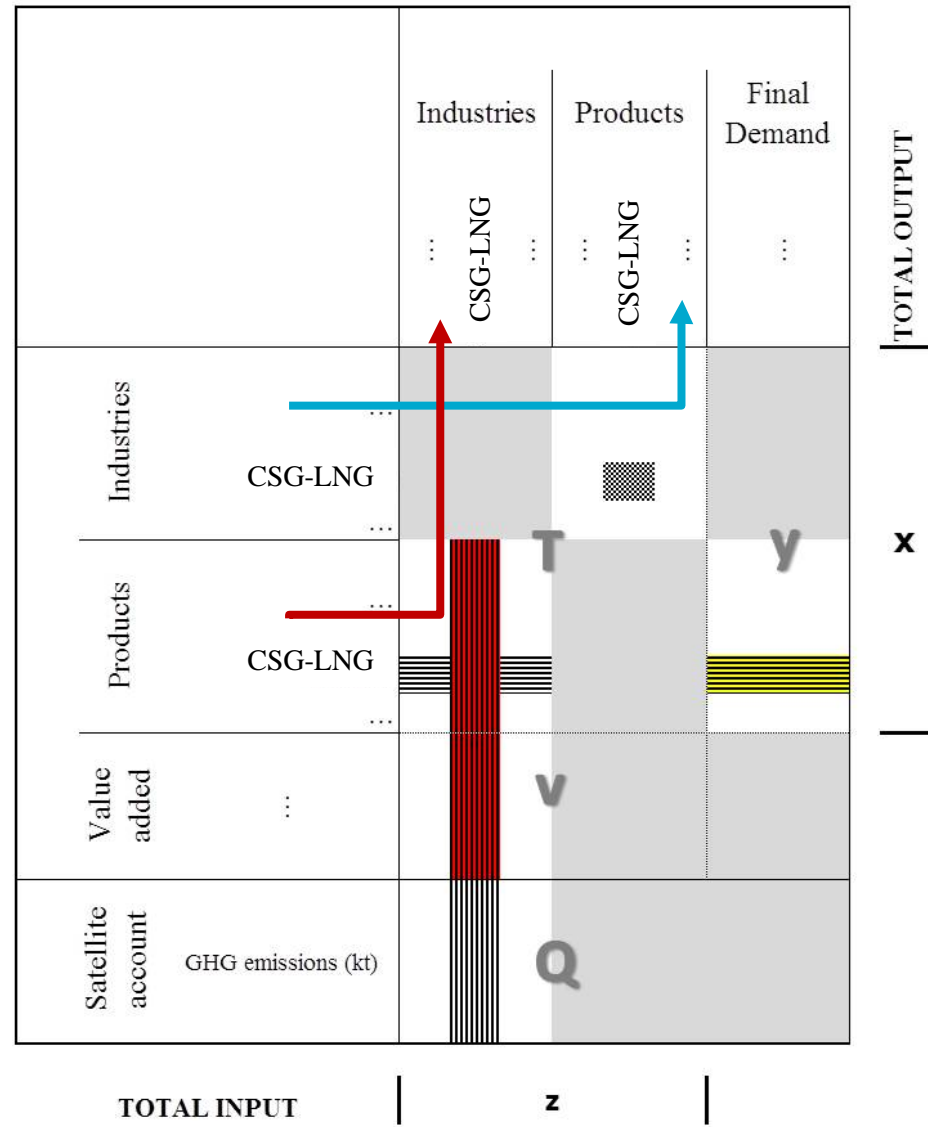
# Approach: input output analysis

## IELab

Based on ABS data for over 1000 products and Emissions data from National GHG Accounts and NGRS



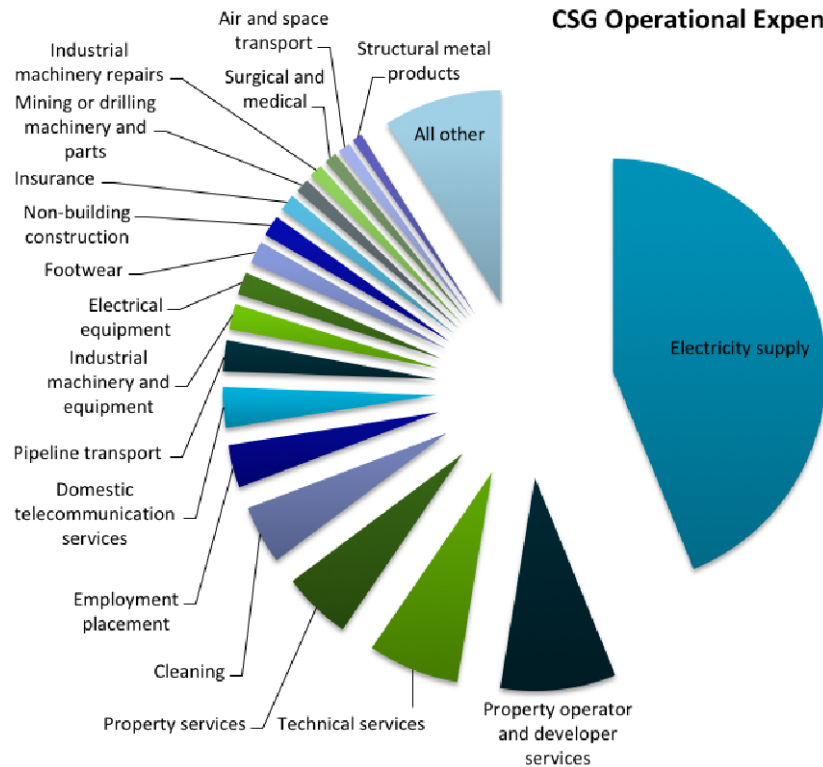
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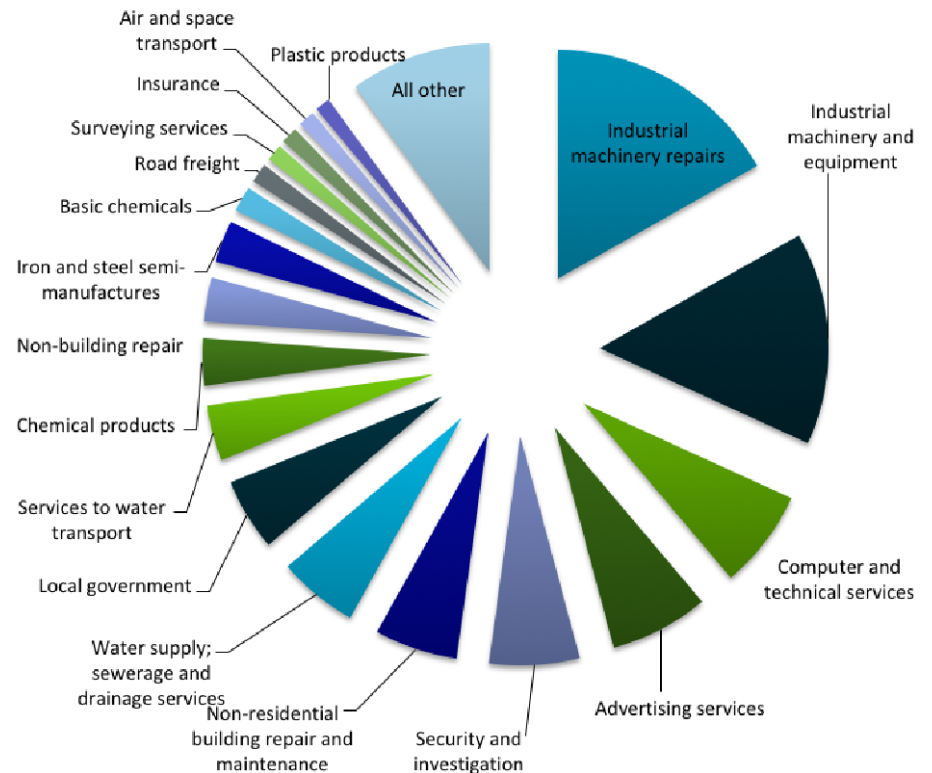


# Inputs – expenditure records

CSG Operational Expenses



LNG Operational Expenses



# Inputs and Assumptions



Direct access to company records

Site visit to Condabri

Access to technical data

NGERS reporting

Quarterly production reports

Annual Reports





# Assumptions

Scenario of long-term average sales volume production based on known contracts. Natural gas flows are all CSG.

| Destination of flows of sales production                       | Estimated Intensities for future operations (\$/PJ) |
|--|---|
|  | 55PJ/year   |
| LNG Exports to Japan   | (1000kton/year)                                     |
|  | 421PJ/year  |
| LNG Exports to China   | (7600kton/year)                                     |
| Natural Gas Consumption and Electricity Generation (Australia) | 100PJ/year  |
| <b>Total energy value of average annual production</b>         | <b>576PJ/year</b>                                   |

# Assumptions

Scope 1 GHG emissions intensities per PJ of LNG, and totals from the CSG and LNG operations at 2015/16 and for future scenario production levels .

|   | CSG                                     | LNG                                      | TOTAL           |
|---|---|--|-----------------|
| Estimated Direct GHG intensity<br>(KtonCO <sub>2-e</sub> /PJ)                   | 1.499 <sup>c</sup>                      | 3.956 <sup>b</sup>                       | 4.77 (scenario) |
| Reported or Estimated total for 2015/16<br>(KtonCO <sub>2-e</sub> )             | 581.6 <sup>a</sup><br>(388PJ CSG)       | 454.7 <sup>d</sup><br>(98PJ LNG)         | 1036.3          |
| Estimated total for Future Production Scenario<br>(KtonCO <sub>2-e</sub> /year) | <b>863.4<sup>e</sup></b><br>(576PJ CSG) | <b>1883.1<sup>e</sup></b><br>(476PJ LNG) | <b>2746.5</b>   |

Sources: a) reported in NGER data; b) for normal and occasional outage periods, not including commissioning and ramp up – emissions included in the total: CO<sub>2-e</sub>, natural gas, diesel, oils, greases, refrigerants (propane and ethylene), fugitive emissions (venting and flaring), fugitive emissions (other than venting and flaring), SF<sub>6</sub>, from commercial in confidence information; c) derived from a) and sales volumes of 388PJ of CSG; d) derived from b) and sales volumes of 98PJ LNG consistent with revenue data for 2015/16; e) based on the scenario of production .

# Outputs

Direct and total impacts of production activities by APLNG, as an intensity (ktonsCO<sub>2</sub>-e /PJ) and total (ktonsCO<sub>2</sub>-e /year) for the future scenario of production (rounding affects some totals)

| Scope        | Emissions Intensity<br>(Kt CO <sub>2</sub> e/PJ) | Total Emissions<br>CO <sub>2</sub> e (Kt CO <sub>2</sub> e/year) |
|--------------|--|--|
| Scope 1      | 4.77   | 2746   |
| Scope 2*     | 2.58   | 1486   |
| Scope 3**    | 0.28   | 149  |
| <b>Total</b> | <b>7.63</b>                                      | <b>4394</b>  |

\* emissions from purchase of grid electricity in Queensland

\*\* does not include shipping, re-gasification and final combustion of CSG or LNG

# Meaning of Outputs

- Actually the additional Scope 3 emissions are small
- About two thirds of total emissions are on-site
- Most of the rest of emissions are from use of grid electricity in the gas fields and...
- Use of gas in turbines at the LNG facility
- From what we know about fugitive methane, they contribute ~ **3% of emissions during production**

# Conclusions

- Most comprehensive Scope 3 GHG footprint assessment of CSG-LNG business in Surat Basin
- Results based on detailed data and access to on-the-ground information from the companies involved
- Total GHG Footprint for CSG-LNG production process is:  
7.63 Kt CO<sub>2</sub>e/PJ
- Most emissions arise on-site or through electricity use



# Thank you

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