

LIFE CYCLE INVENTORY

11 december 2018

Asfaltdag
2018
De actualiteit van mobiliteit

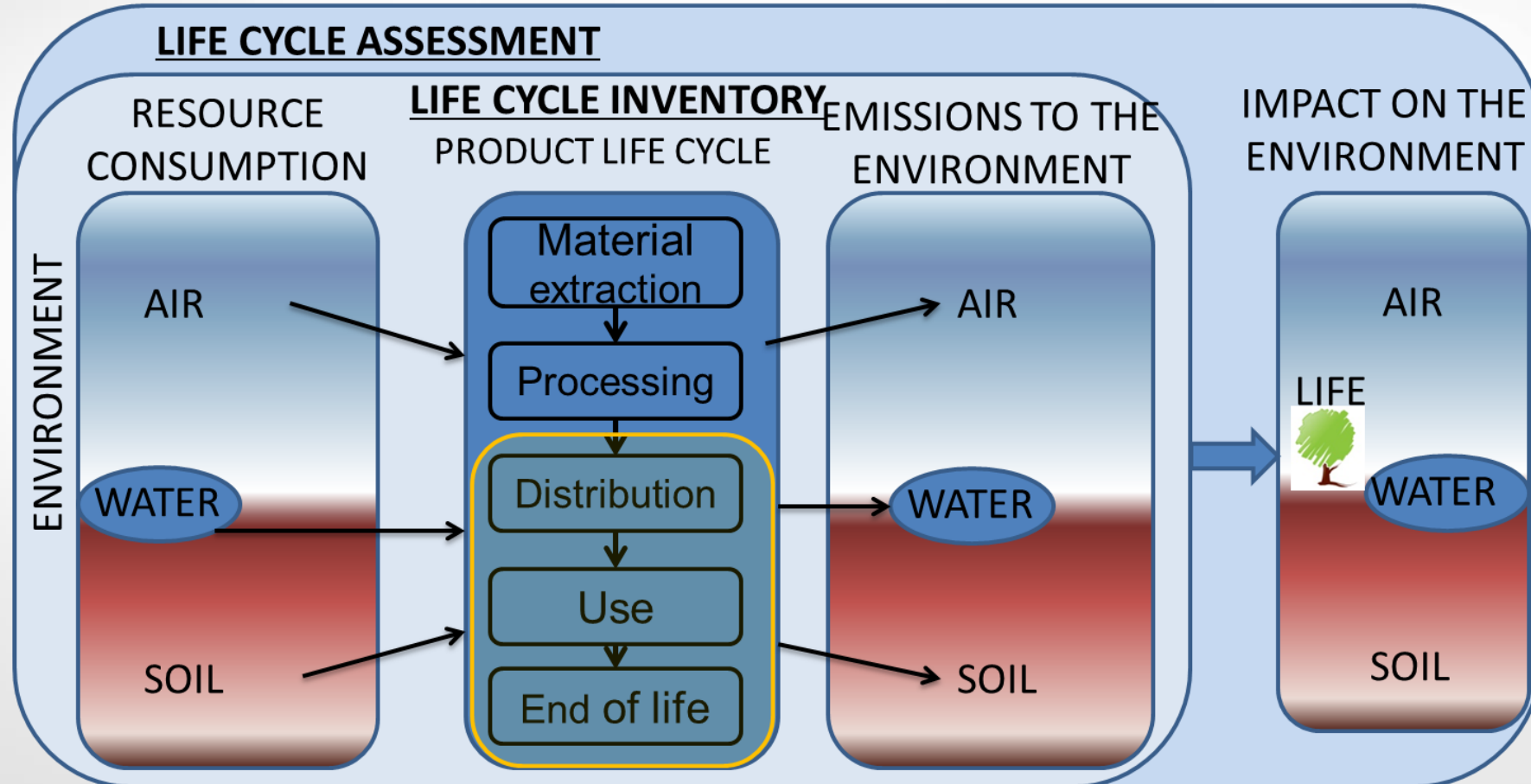


EUROBITUME LCI - GOAL & SCOPE

- **Goal:** provide inventory data on the bitumen production as a building block for further implementation in LCIs & LCAs of products using bitumen
- **Audience:** bitumen customers, specifiers, procurement agencies...
- Product under study:
 - 1 t paving grade bitumen, EN 12591
 - System boundary; Cradle-to-refinery gate study
- **Current status:** Final draft in verification process



EUROBITUME BENELUX: LCI & LCA



INTRODUCTION

For the 2018 Eurobitume update, 4 main topics are revised.

Disclaimer: Report is still under a final revision and some small changes on figures remain possible.

1. Crude oil extraction data

- Update of data
- Not a single year, but a 5 year period

2. Crude basket

- Revision of crude basket to be more representative to crude oils used for bitumen production

3. Crude transport

- Update of shipping data and update of transport due to revised crude basket

4. Refining allocation

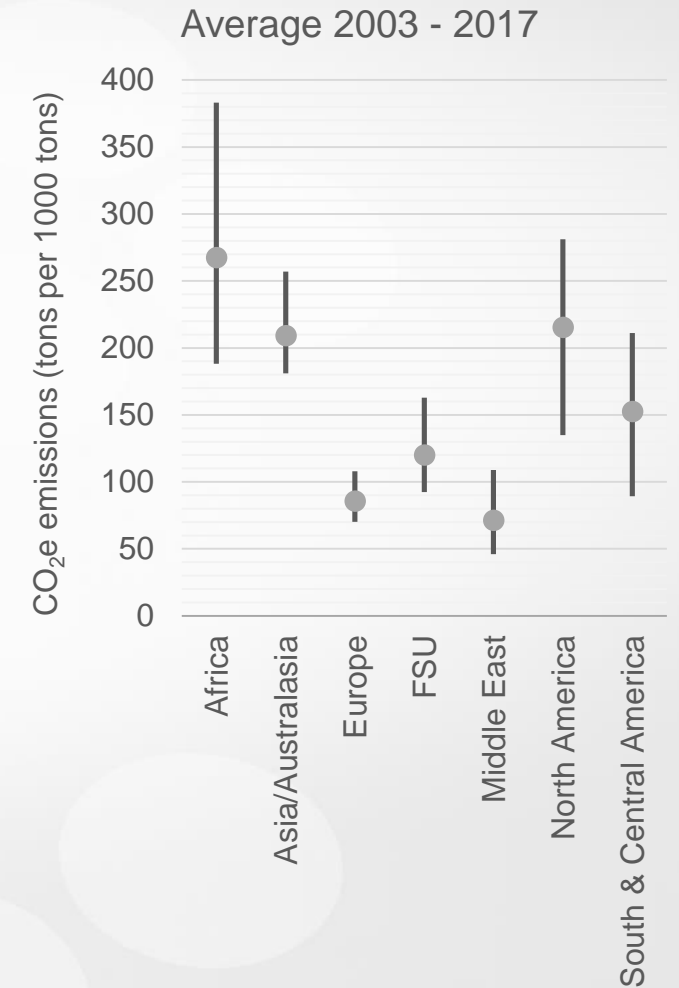
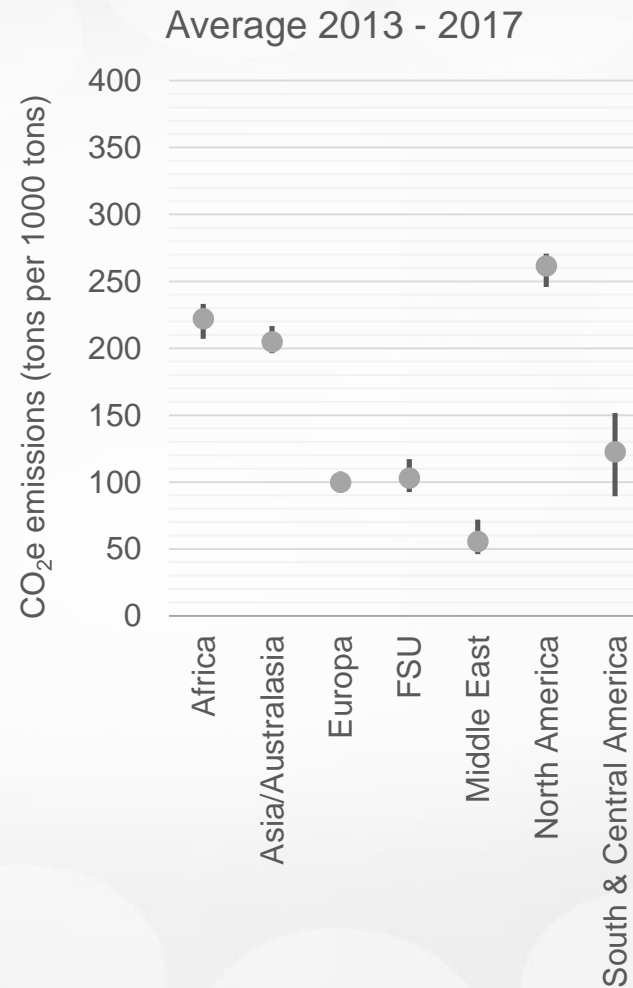
- Thermodynamic approach

5. Storage – no change



UPDATE OF THE CRUDE OIL EXTRACTION DATA

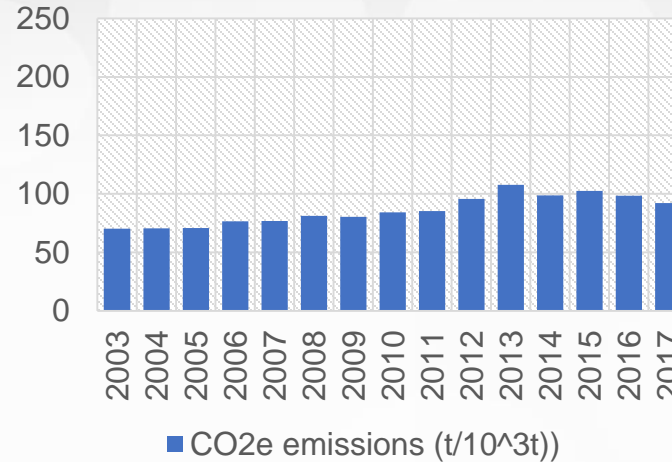
- Data is derived from the International Oil & Gas Producers' Association (IOGP) Environmental Performance Indicators reports, the most recent being 2017.
- Data available from IOGP are believed to be the most reliable source for crude oil extraction.
- Data for crude oil extraction are averaged over a 5 year period (2013 – 2017).



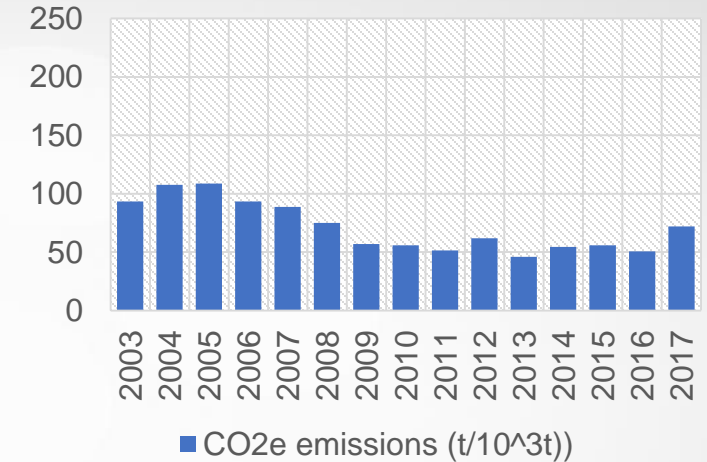
UPDATE OF THE CRUDE OIL EXTRACTION DATA (CO₂e IN TONS PER 1000 TONS)

- In the previous LCI data from a single year, 2009, were used.
- However, differences in reporting suggest that data from single years may not provide a representative picture, therefore mean values of the reported data for the years 2013 – 2017 were selected for this report.

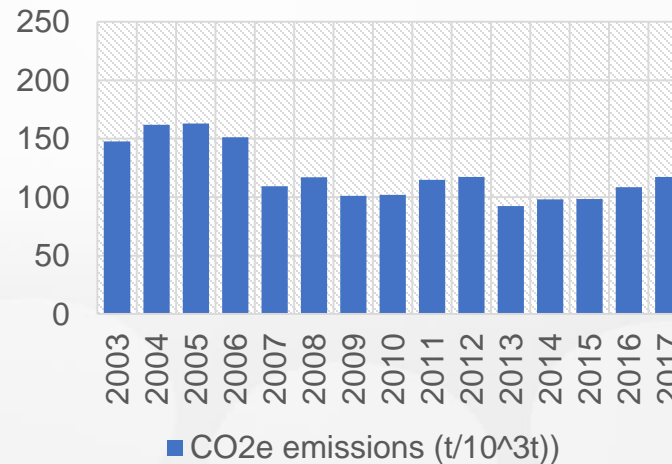
Europe



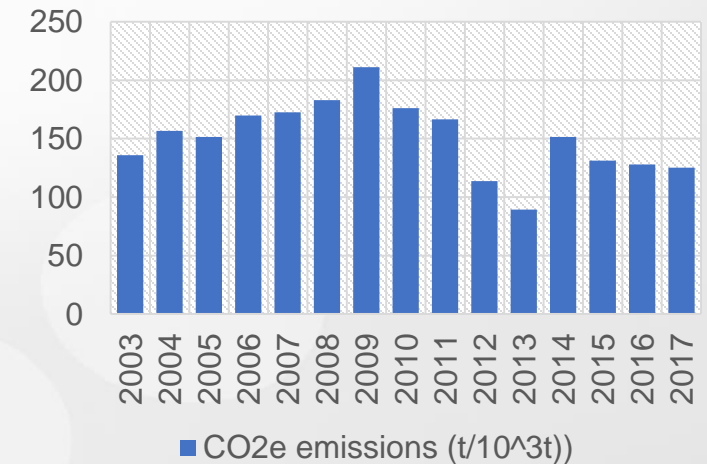
Middle East



FSU

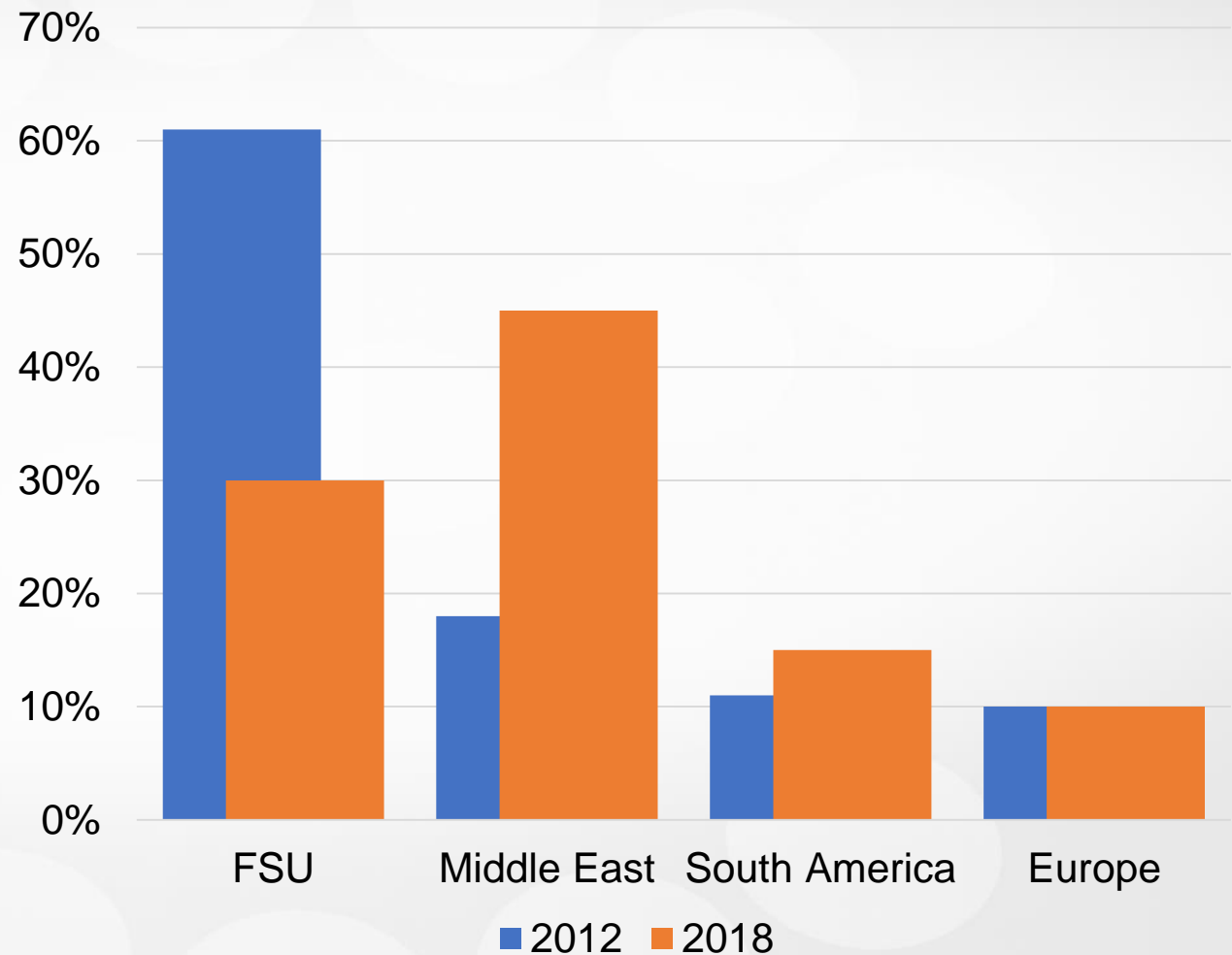


South & Central America



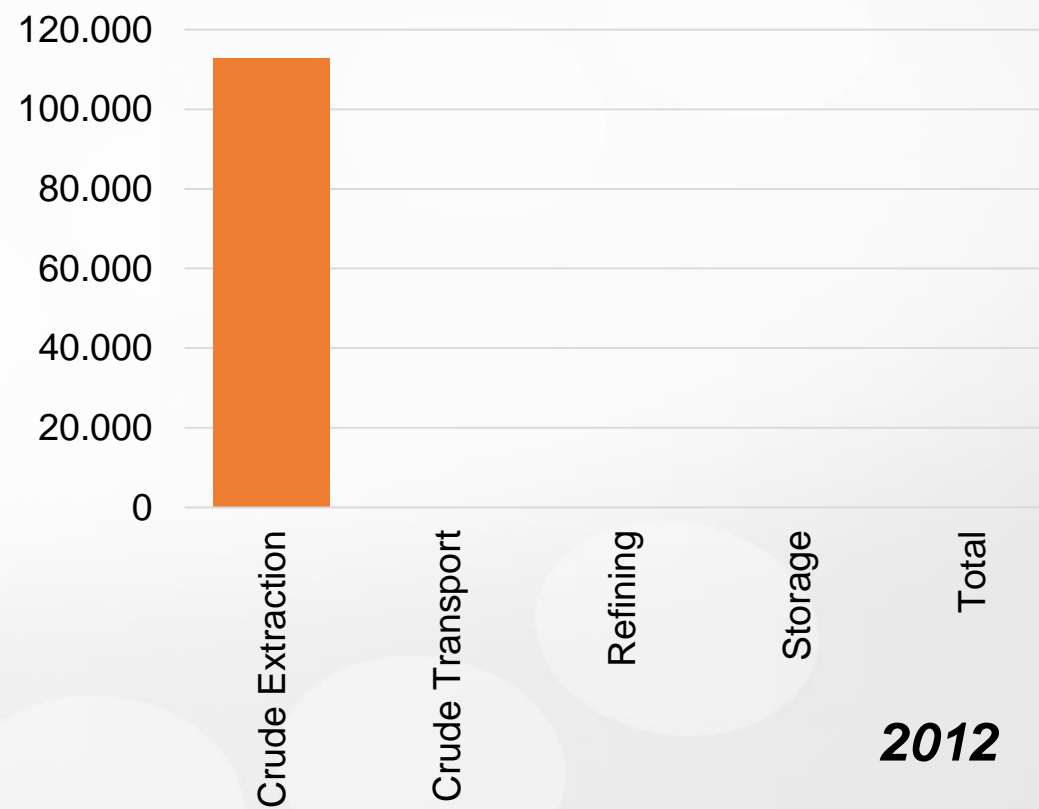
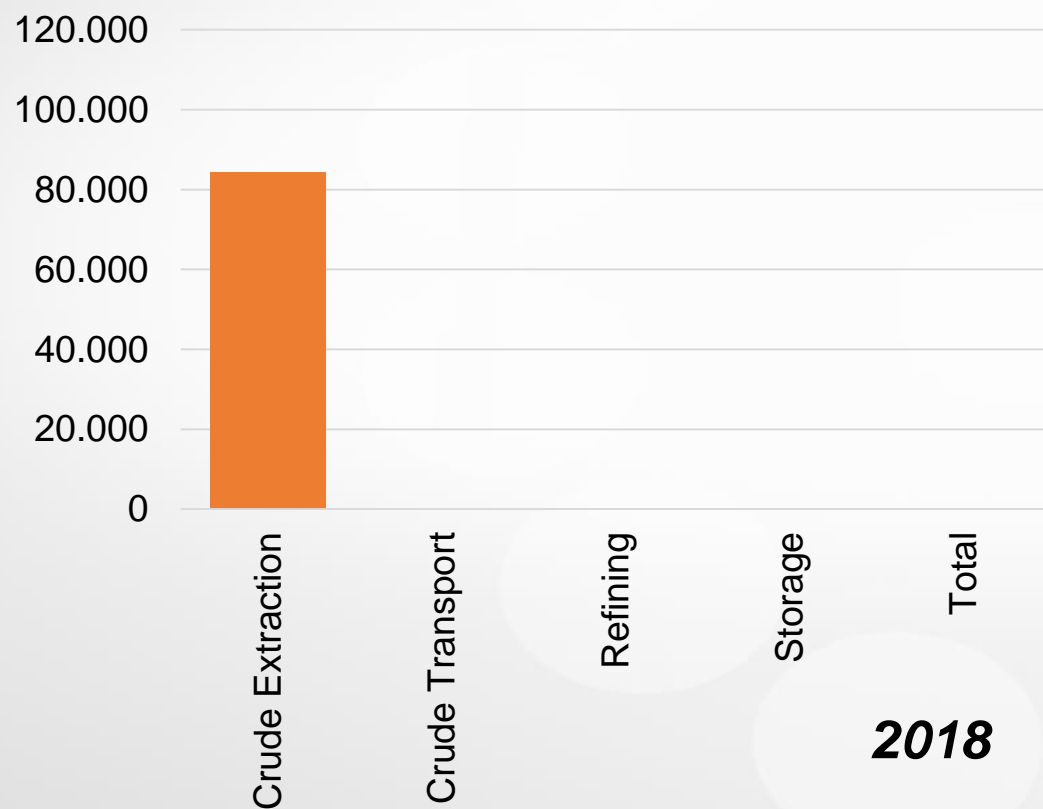
REVISION OF THE CRUDE BASKET

- The European Union collects information on crude oil consumption within the EU but these are not representative of the typical crude oils used for bitumen manufacture.
- A review was conducted to develop a revised diet.
- The revised figures were reviewed by Concawe and are believed to represent a contemporary typical crude diet for bitumen production.



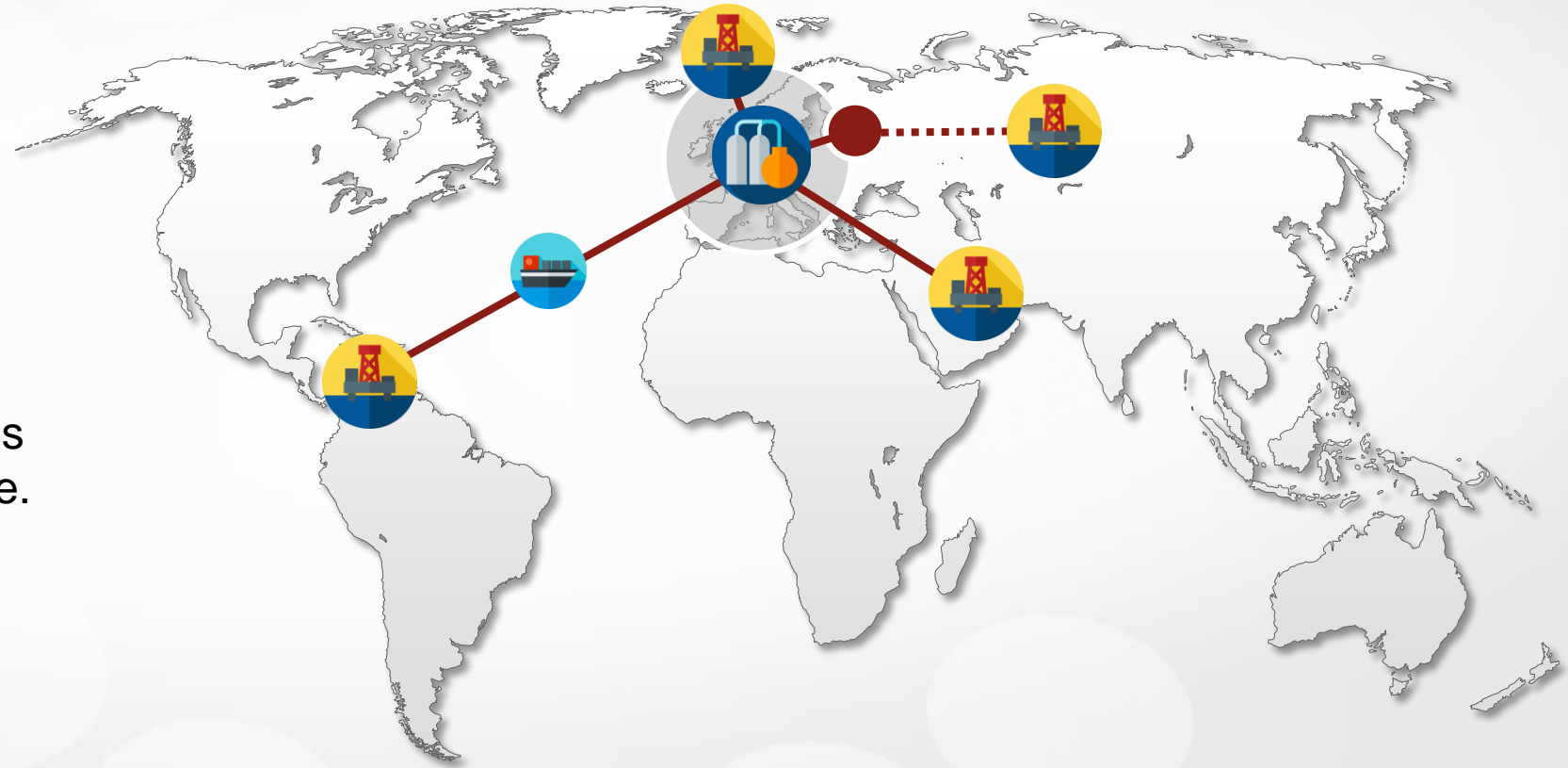
BITUMEN EMISSIONS – CO₂e (GRAM PER TON)

Change due to updated extraction data
and revised crude basket.



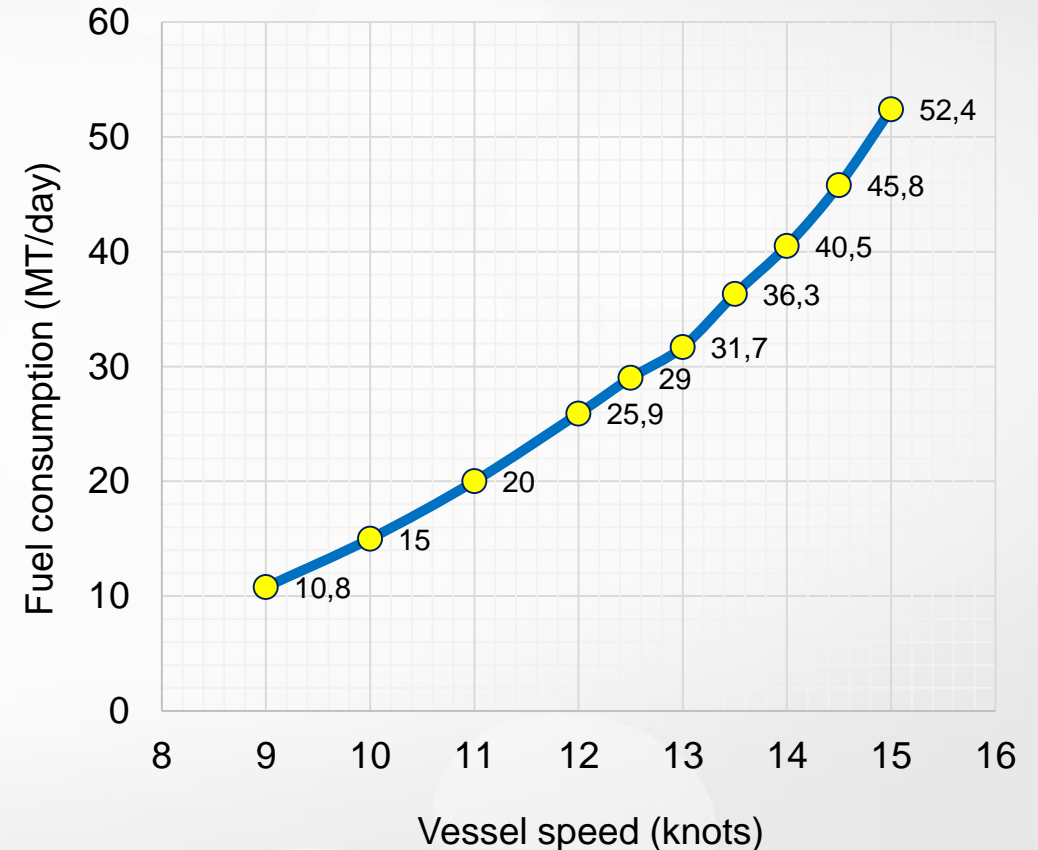
CRUDE OIL TRANSPORTATION

- Crude oils for European bitumen production are mainly transported to the refinery by ship.
- The exception is Former Soviet Union crude oil, that is partly transported by pipeline.
 - In this study it is assumed that the FSU crude oil is transported from the Samara area to the Baltic Sea by the Baltic Pipeline System (BPS) and then, from the Baltic Sea to the ARA region, by ship.



CRUDE OIL TRANSPORTATION

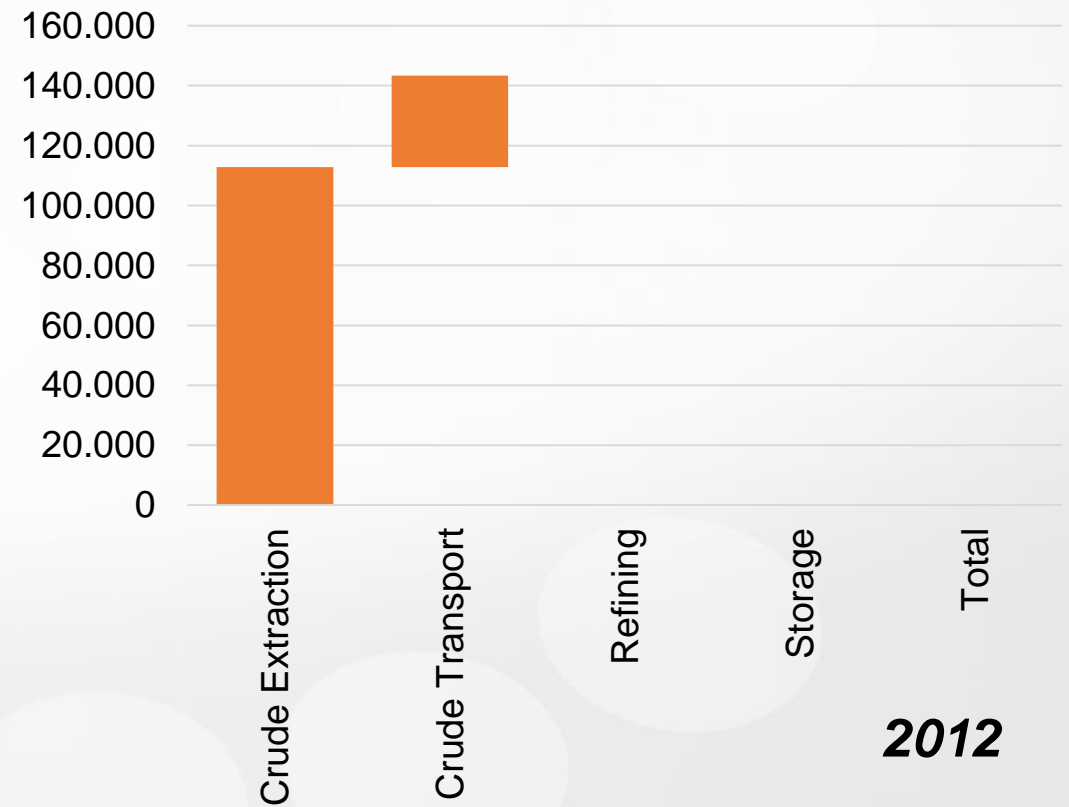
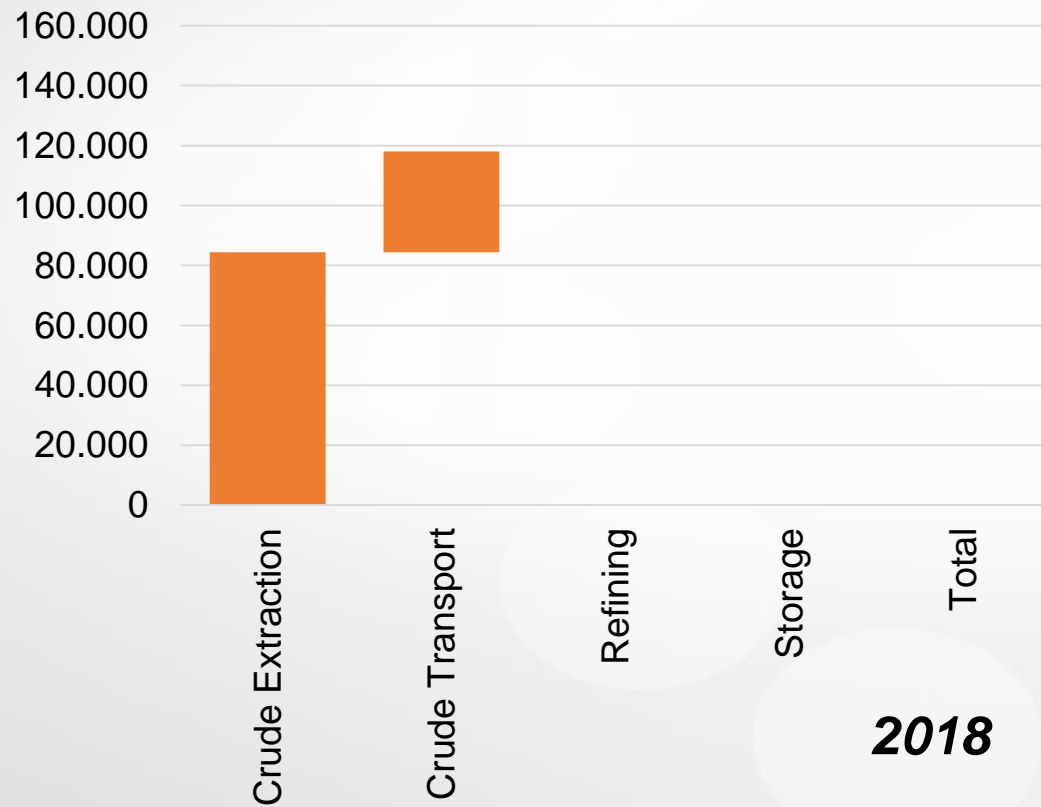
- Fuel consumption is highly functional of the ship's speed.
 - Average speed of tankers is 10 to 15 knots and in this revision a speed of 13.5 knots is used (as in the 2012 report).
 - A new ship is used.
- For pipeline transport It is assumed that electricity was produced by a diesel generator consuming 2 litres of diesel per kWh
 - This value is a significant change from the 2012 report and the energy consumption is taken from EcoInvent ver 3.3.
 - This is a conservative assumption as it is known that some of the power consumed is also produced by gas-driven generators and some comes directly from the grid.



Source: Wartsila Aframax Design

BITUMEN EMISSIONS – CO₂e (GRAM PER TON)

Some changes as revised crude basket influenced shipping distances.

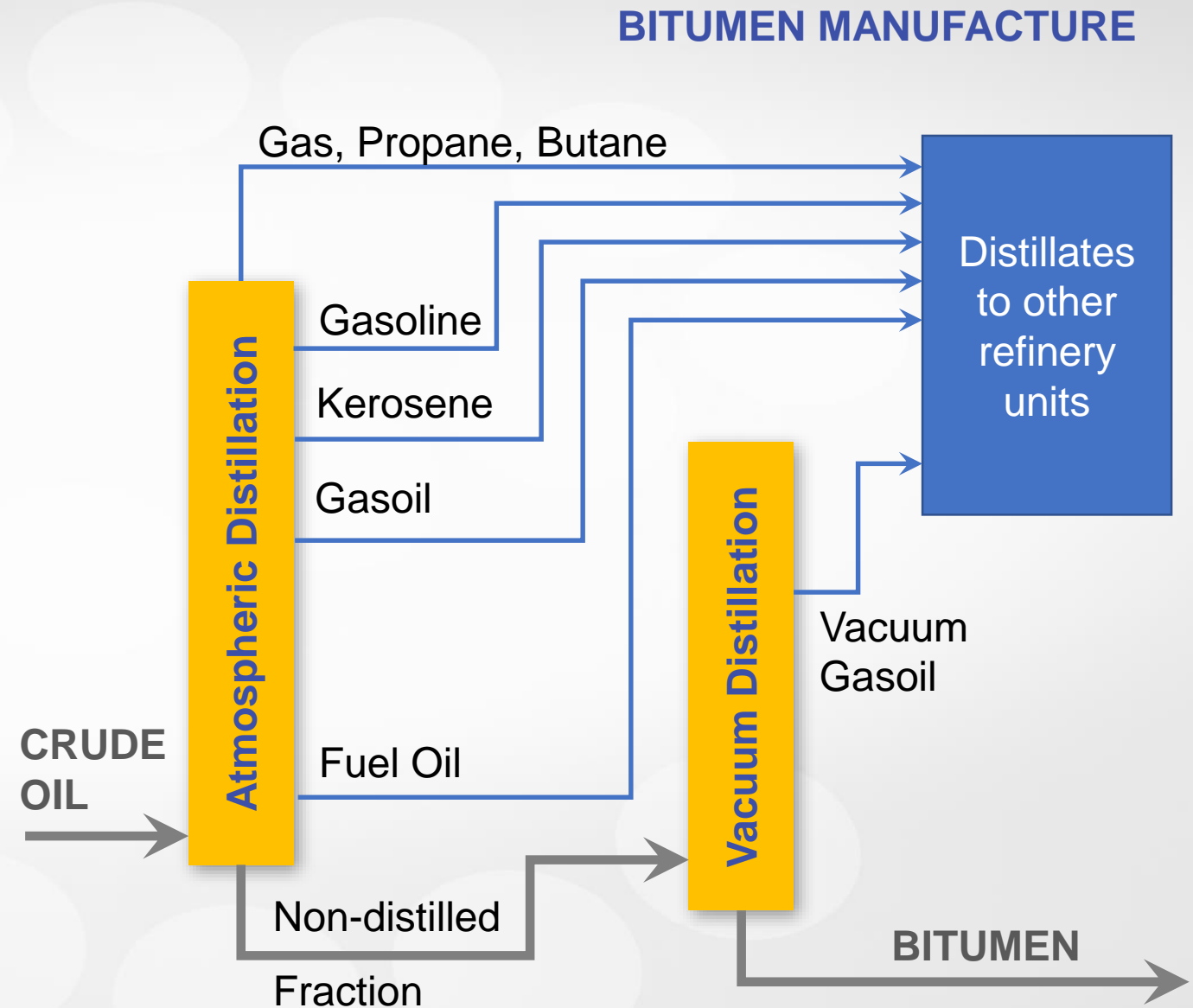


2018

2012

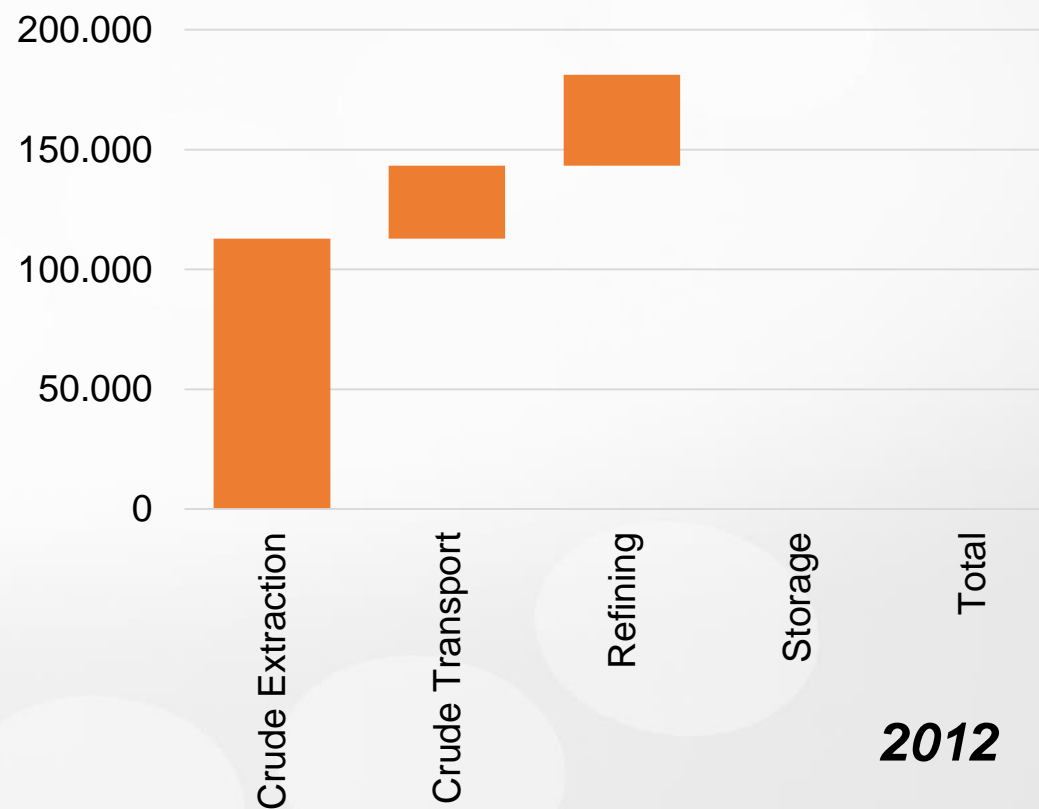
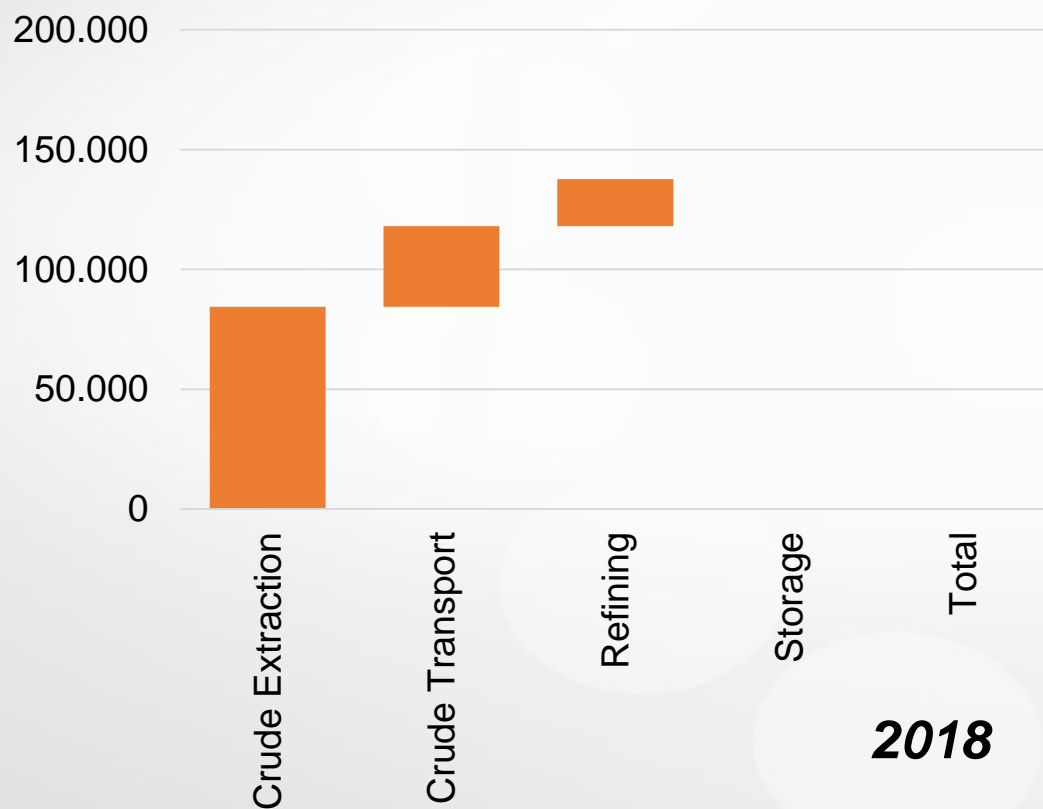
REFINING

- The allocation of energy and emissions at the refining level is complex due to the numerous coproducts produced during the distillation process.
- An economic allocation was used in the previous LCI,
 - This is the method used within the refinery to determine a relative value for different oil products.
- However, the process of distillation is governed by the thermodynamic principals governing change-of-state (from liquid to vapour), therefore an approach based on this is used.



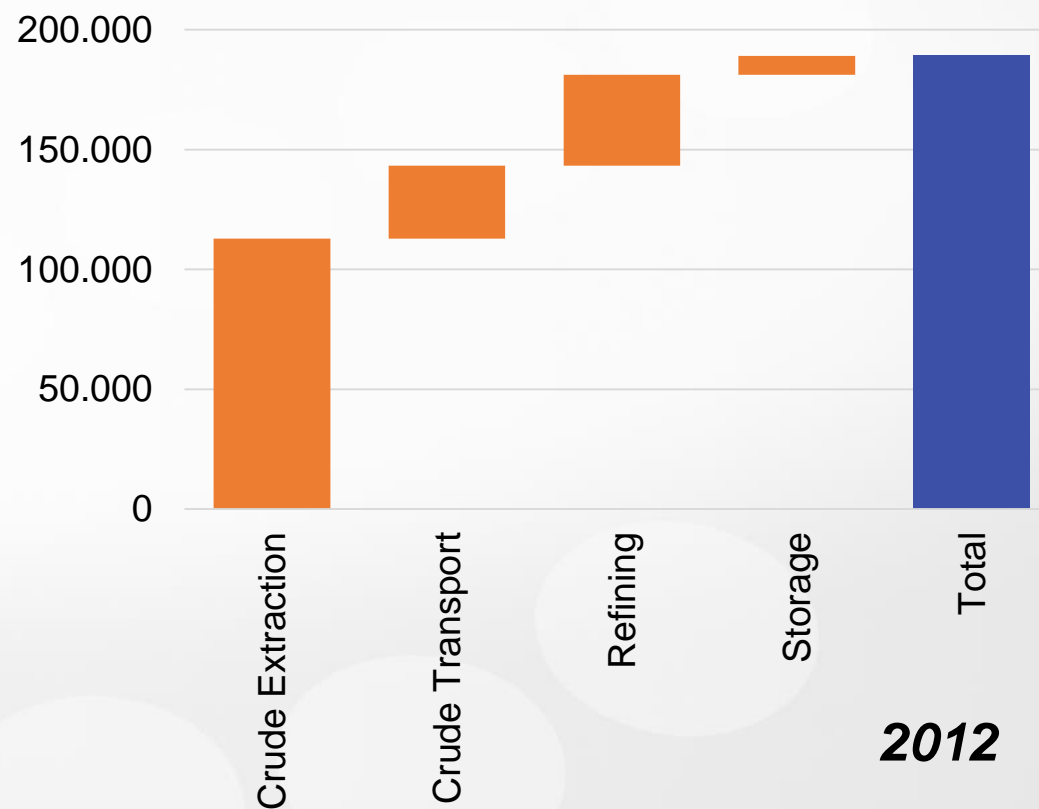
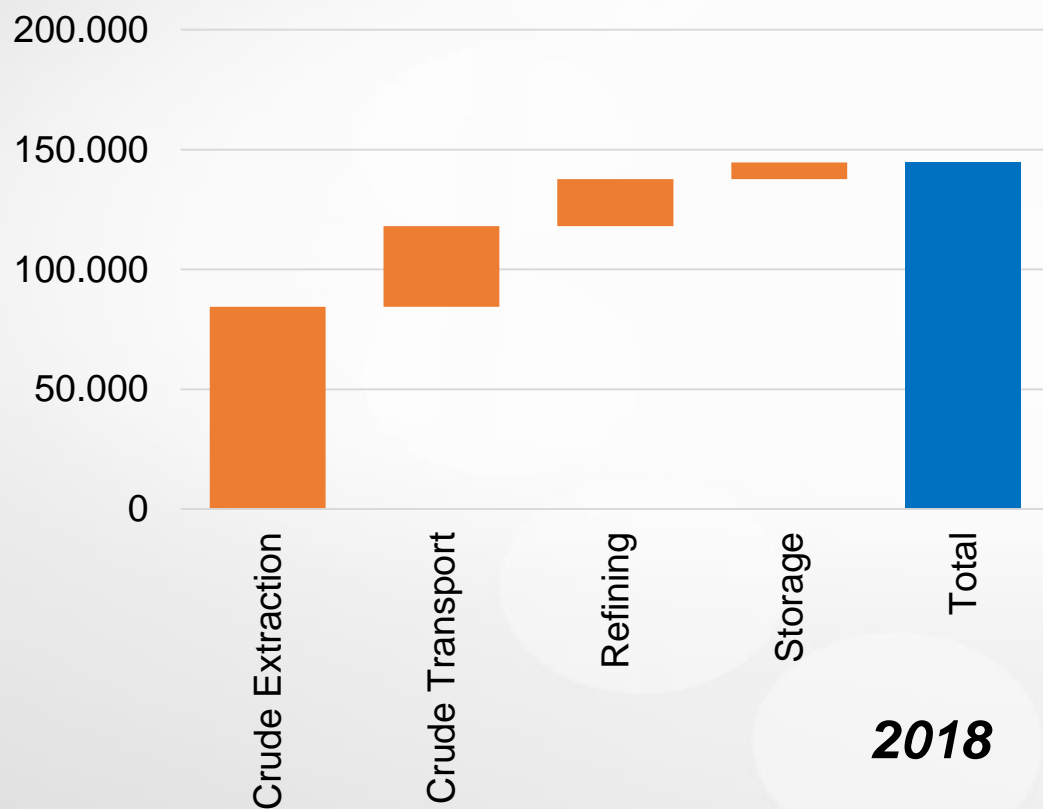
BITUMEN EMISSIONS – CO₂e (GRAM PER TON)

Changed allocation approach has some impact on the refining emissions



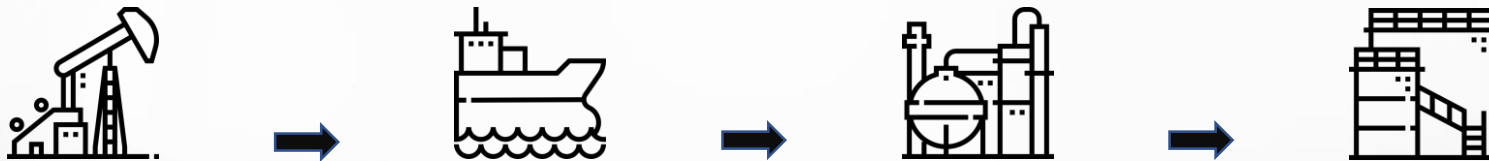
BITUMEN EMISSIONS – CO₂e (GRAM PER TON)

Finally, the revision results in ~ 145 kg CO₂e per tonne of bitumen.



WHAT DOES THIS FIGURE INDICATE AND HOW TO USE IT?

- The LCI calculation is based upon a hypothetical refinery, based on the ARA region and running a typical crude diet used for bitumen production.
- The LCI data are valid for bitumen produced and loaded in a European refinery.
 - it is a “cradle to gate” study.



- The figure represent an average value applicable to bitumen produced in **any** refinery in Europe.
- Transport to customer and/or depot is **not** included in this LCI figure.

THANK YOU FOR YOUR ATTENTION

7th E&E CONGRESS
EURASPALT & EUROBITUME
MADRID 12-14 May 2020
Palacio Municipal de Congressos de Madrid

ASPHALT 4.0 FOR FUTURE MOBILITY

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Asfaltdag
2018
De actualiteit van mobiliteit

 eurobitume