

Life Cycle Analysis

*Screening –
A comparison between materials for
200 ml bottle incl. recycled*

Nolato Pharma Packaging
March 2020 (v.2)



Compared products & Data used



Data

- **Primary data** – Weight of materials, Distance of distribution, amount of production, Packaging
- **Generella data** – production upstream, transport, waste treatment.
 - Ecoinvent 3.5 - allocation, Cut off – system



Developer
with Share & Collect

Release 9.0.0.48 Multi user

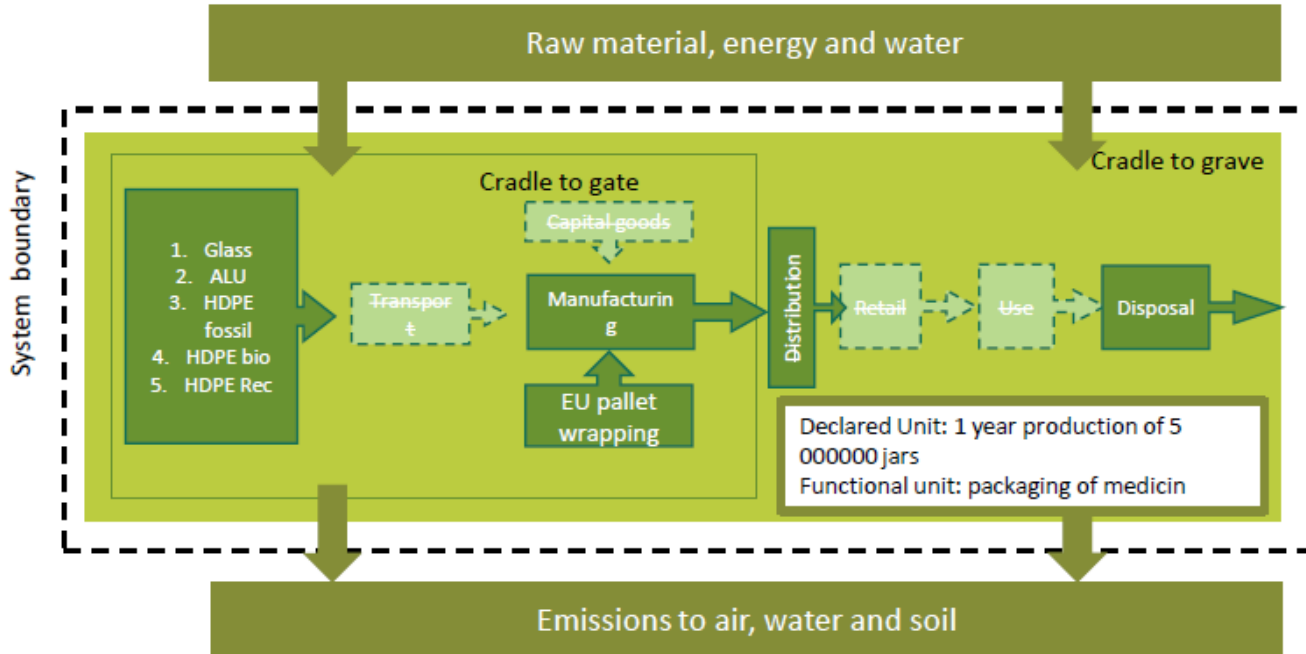
Miljogiraff

Your service contract will expire after 2021-03-01.

Environmental impact

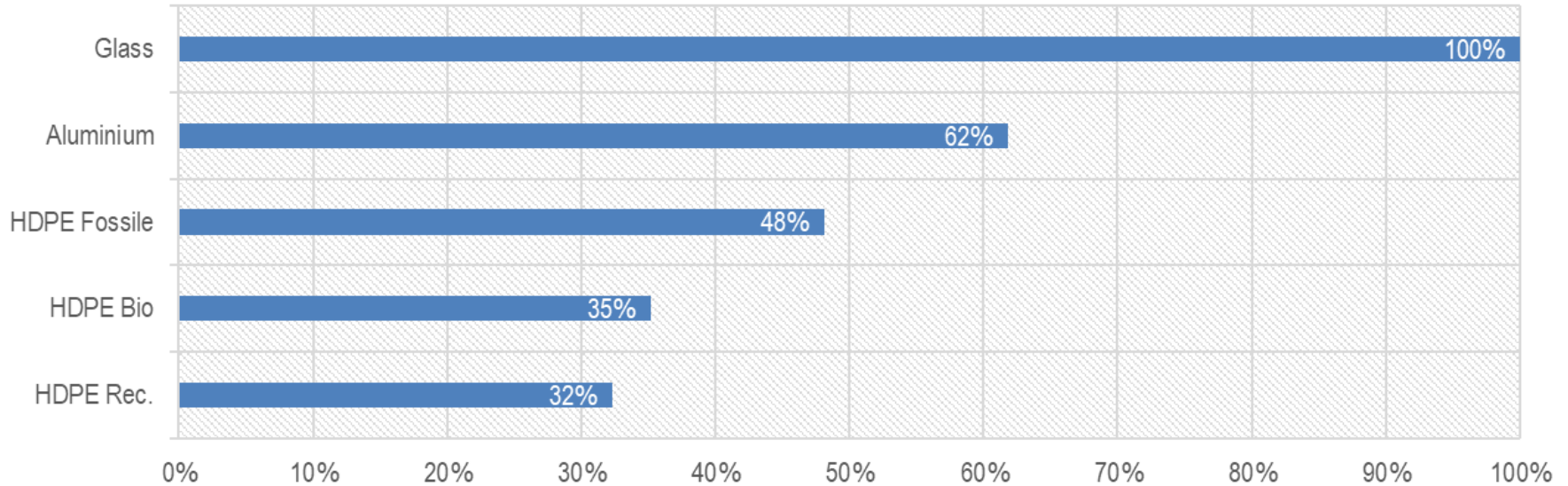
- **Methods:**
 - IPCC 100 years, 2013 V1.03
 - EF Method (adapted) V1.00
- **Effect categories**
 - **Global warming potential (GWP)**
 - EF-Climate Change.
 - EF-Ozone depletion
 - EF-Ionising radiation - human health
 - EF-Photochemical ozone formation - human health
 - EF-Respiratory inorganics
 - EF-Non-cancer human health effects
 - EF-Cancer human health effects
 - EF-Acidification terrestrial and freshwater
 - EF-Eutrophication freshwater
 - EF-Eutrophication marine
 - EF-Eutrophication terrestrial
 - EF-Ecototoxicity freshwater
 - EF-Land Use
 - EF-Water scarcity.
 - EF-Resource use, energy carriers
 - EF-Resource use, mineral and metals

LCA model – Containers



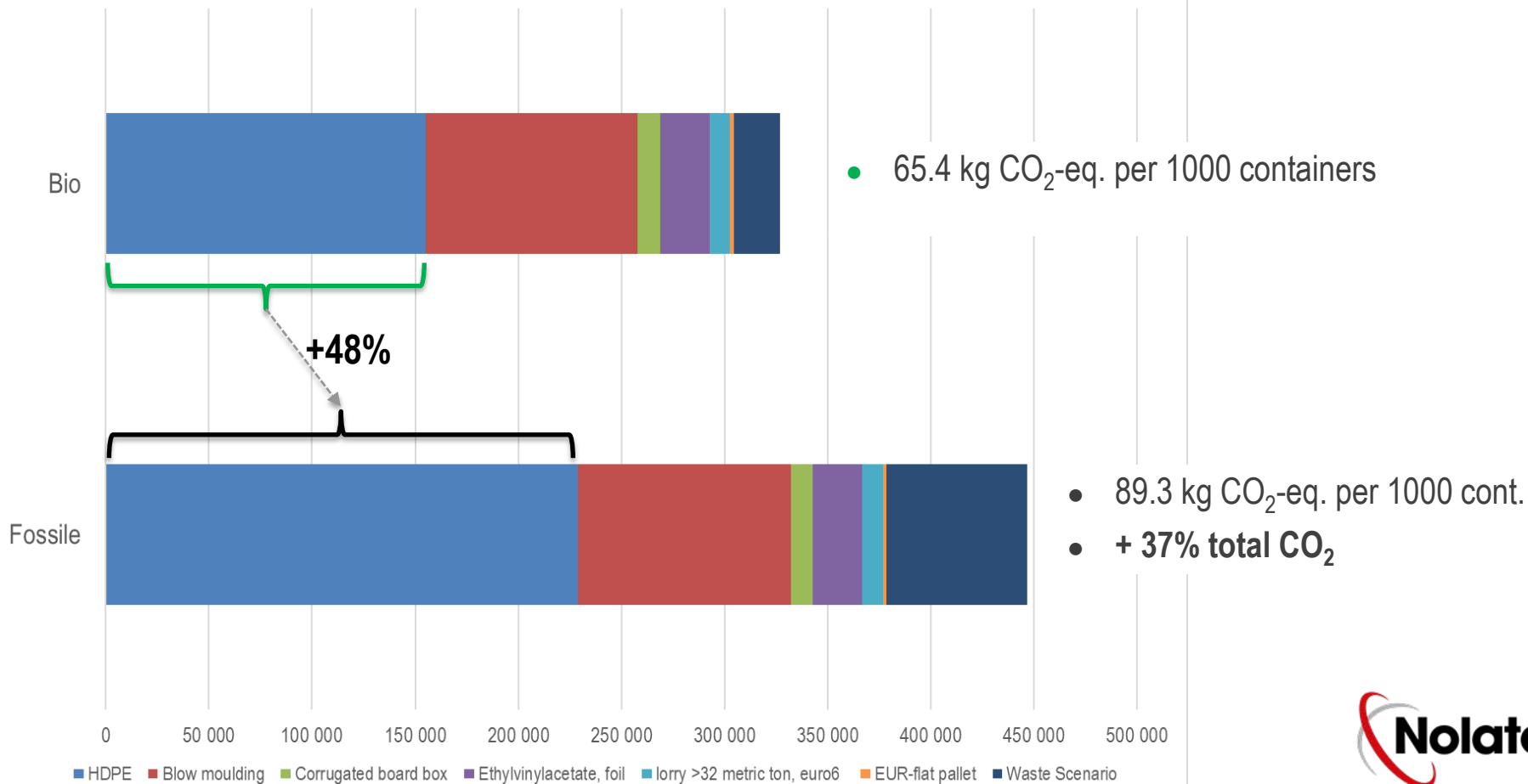
Climate Change (relative CO₂ eq. Glass as basis, [IPCC 2013])

Relative CO₂ eq. with Glass as reference [IPCC 2013]

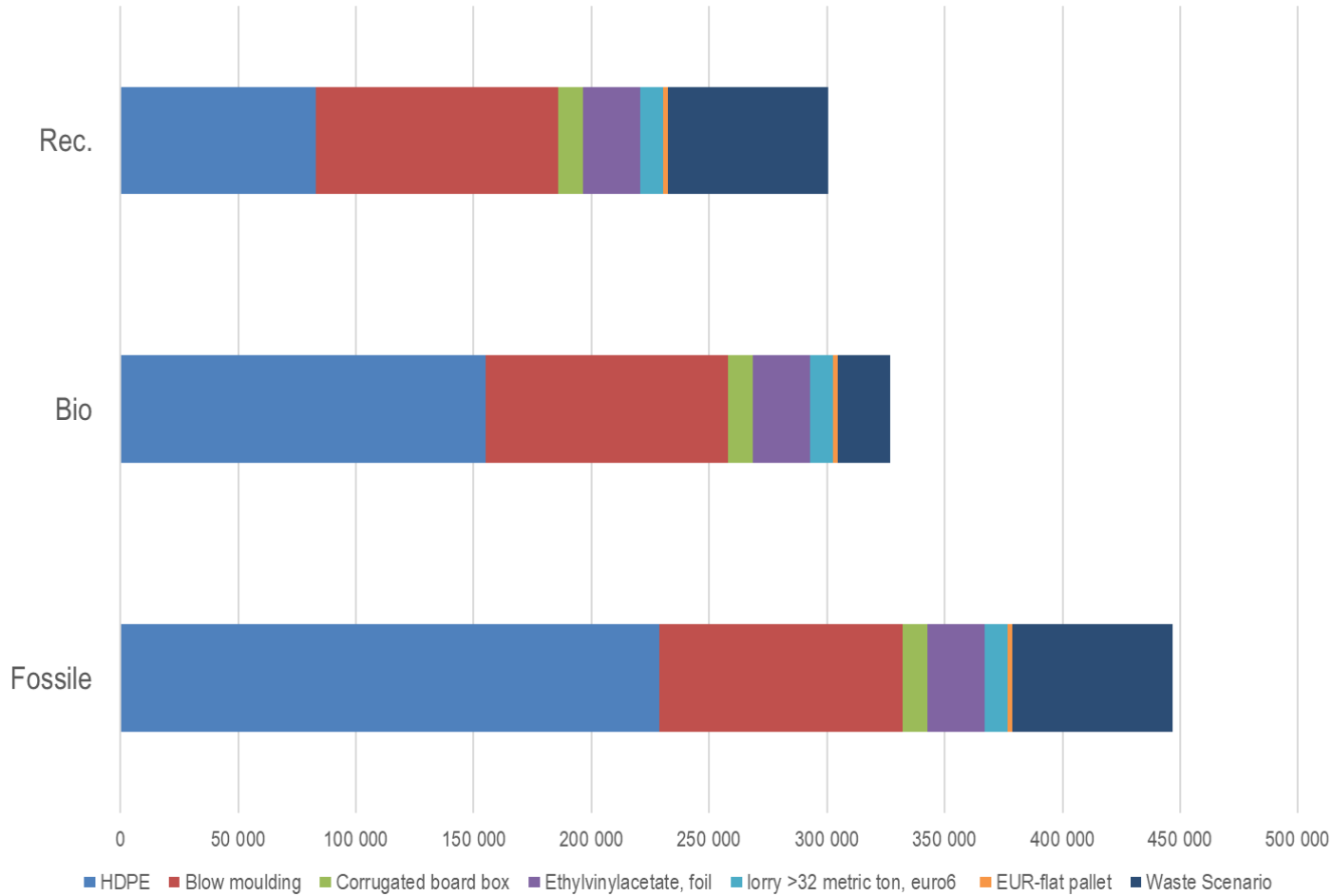


HDPE comparison Bio/Fossile, GWP (kg CO2 eq), One year (5,000,000 jars)

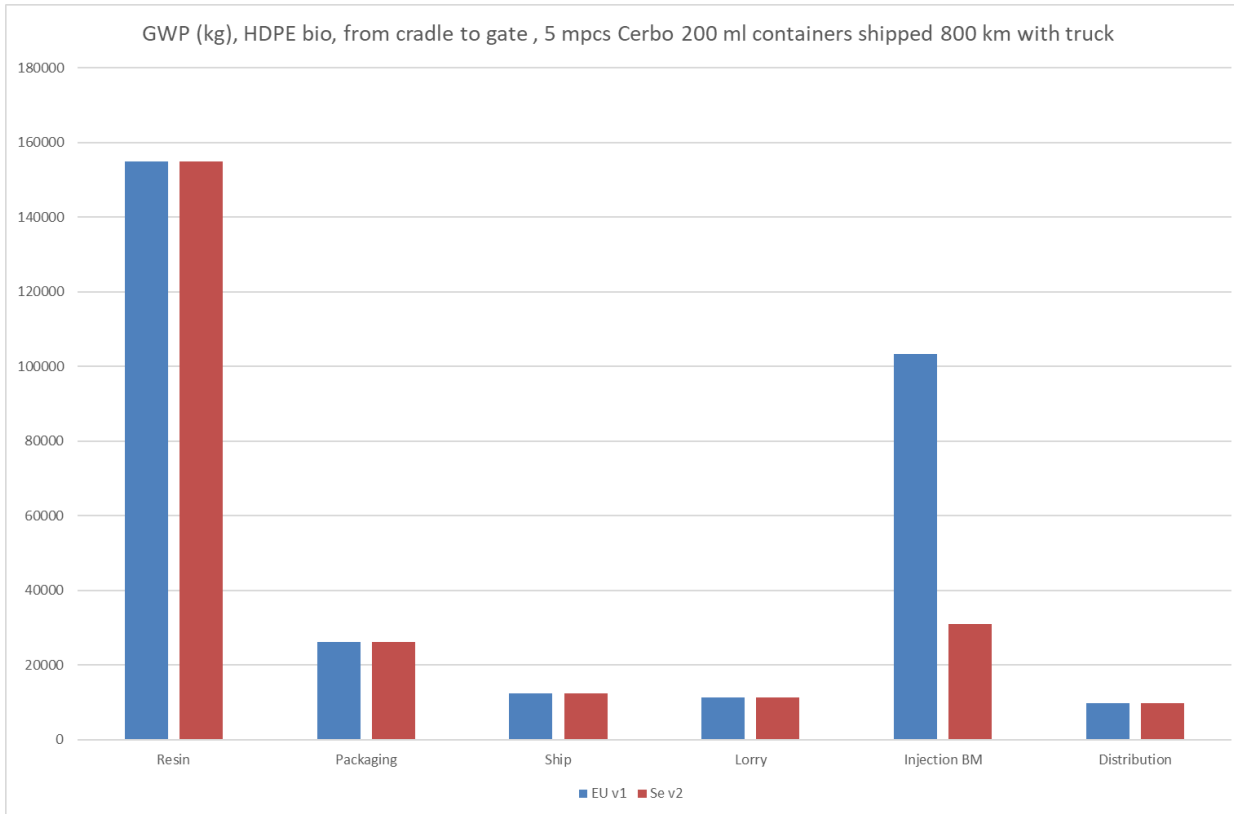
GWP = Global Warming Potential



HDPE comparison Recycled/Bio/Fossile, GWP (kg CO2 eq), One year (5,000,000 jars)



Comparison CO₂ in energy base for manufacturing



Blue graph shows EU average

Red graph shows Nolato site in Europe

- Resin is HDPE Bio (sugarcane based)
- Packaging is secondary packaging, ie cardboard box, shrink wrap and pallet.
- Shipping in this case is the CO₂ equivalence for boat transport from Brazil to Europe for inbound resin
- Lorry is transport from Europe to Sweden for inbound resin
- Injection BM shows difference in CO₂ for production in EU average vs Sweden
- Distribution is truck transport 800 km



Note: this graph was added after initial version and the inbound transport of resin was added to visualize that this is negligible. Keep in mind that fossil polymer cracked in Europe also has inbound transport of oil from M-E, US, Russia, etc

Main Conclusions

Material type

- The Global Warming Potential (GWP) of Plastics shows the lowest compared to Glass and Aluminium
- HDPE has a CO₂-eq. that is only 35% compared to Glass
- Fossil HDPE has a 48% higher GWP than Bio-based alternative
- Use of recycled material offers the smallest CO₂-impact.

Manufacturing Location

- The energy source in the manufacturing location is key
- Using renewable energy sources (green electricity) will strongly support low CO₂-impact and is far more important than transport

Transport

- Transport is negligible in the total amount of CO₂-impact.
- Material type and manufacturing location is by far the most important factors for CO₂-equivalents.