



› **SUSTAINABLE LOGISTICS: IS IT COMPLEX?  
OR DO WE (OVER)COMPLICATE MATTERS?**

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## › PRIORITIES

### SOME THOUGHTS TO START THE DEBATE

1

- Stop procrastinating, we're in a hurry

2

- It is AND ... AND..., not OR ... OR ...

3

- Ask for stringent and effective policy measures

4

- Avoid rebounds

5

- 80% plan A, 20% plan B

6

- Decompose the sector to identify effective measures

7

- Don't overestimate the impact of measures

8

- Use the right metrics

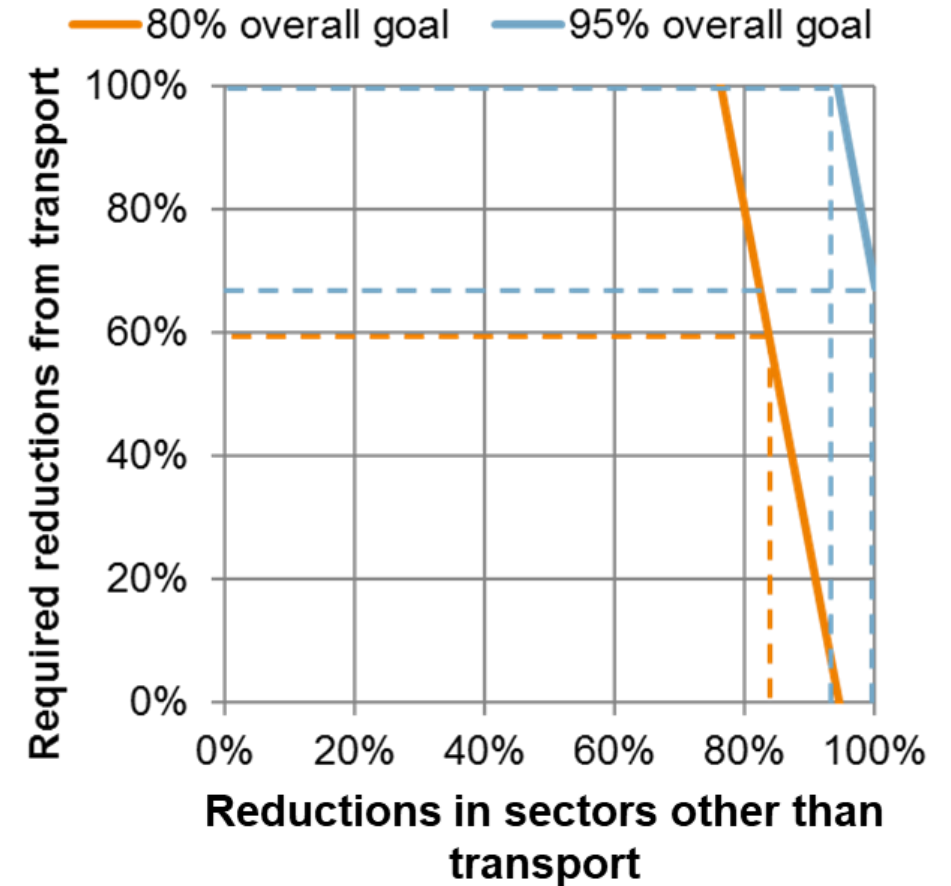
# › WE ARE ONLY BEGINNING TO UNDERSTAND THE CHALLENGE

## PARIS AGREEMENT



COP21 · CMP11  
**PARIS 2015**  
UN CLIMATE CHANGE CONFERENCE

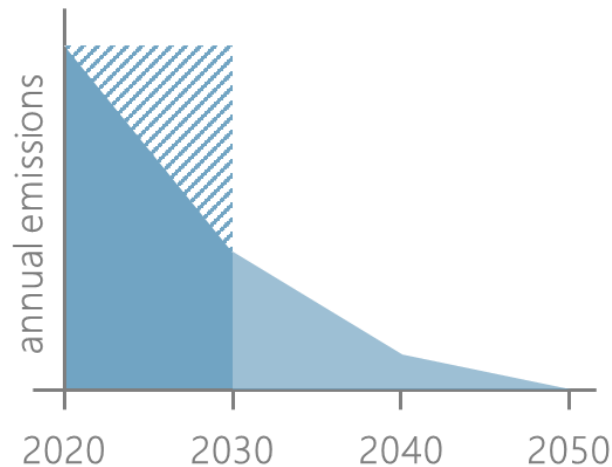
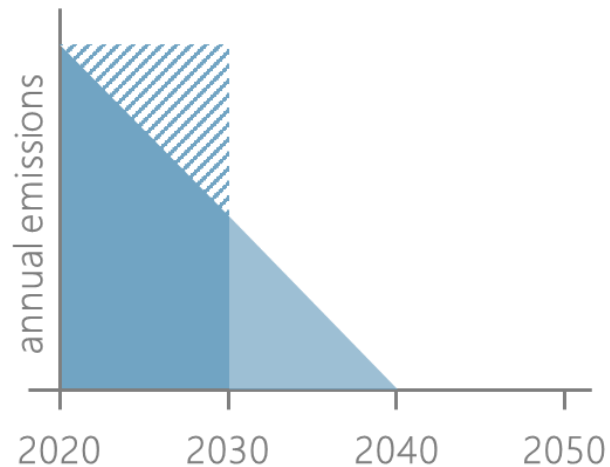
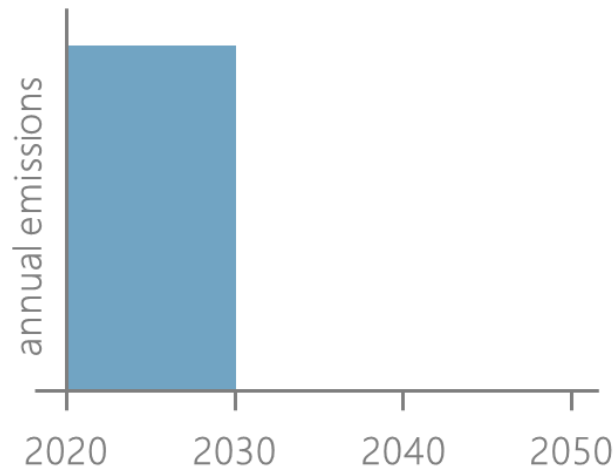
- › Limit global warming to max. 2°C in 2100
  - › requires 80% CO<sub>2</sub> reduction in 2050 relative to 1990
  - › Originally the European Commission set a 60% target for the transport sector (2011 EU whitepaper)
- › Strive for max. 1.5°C in 2100
  - › requires 95% or more CO<sub>2</sub> reduction in 2050 relative to 1990
  - › offers little room for lower reduction in transport sector
    - › also transport sector should strive for > 90% reduction
  - › calls for quick reductions due to finite “carbon budget”



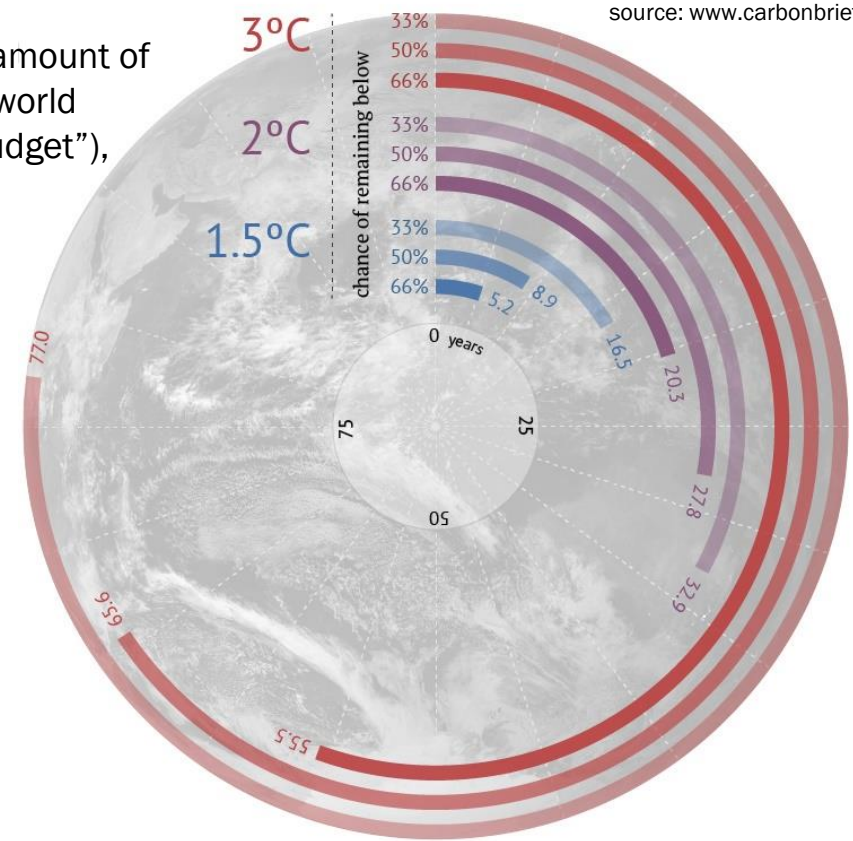
# WE ARE ONLY BEGINNING TO UNDERSTAND THE CHALLENGE

## 1.5 °C IN 2100 MEANS A VERY LIMITED CARBON BUDGET

*Implications of a finite global carbon budget for reduction targets in 2030 and 2050*



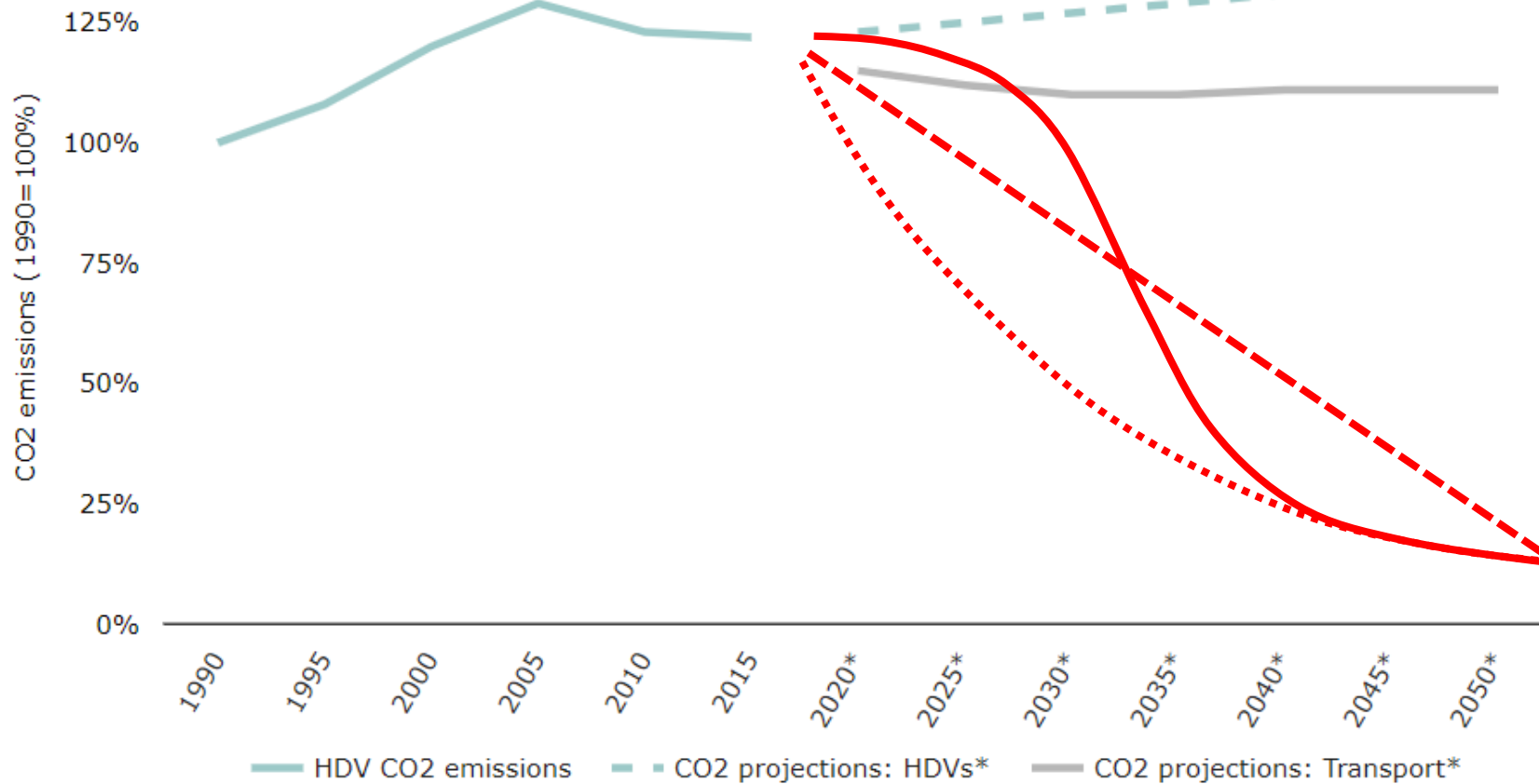
The graph indicates the amount of GHG emissions that the world can still emit ("carbon budget"), expressed in # of years x current annual global emissions, if we want to keep average global temperature increase below 1.5 / 2 / 3 °C.



source: [www.carbonbrief.org](http://www.carbonbrief.org)

## › MOVING IN THE WRONG DIRECTION

### Reported and projected CO<sub>2</sub> emissions from HDVs, EU 28



#### European GREEN DEAL

- › 90% reduction of GHG emissions in transport by 2050
- › no specific 2030 target set for transport sector yet
- › but according to EC's Impact Assessment transport sector would have to reduce only 20% between 2015 and 2030

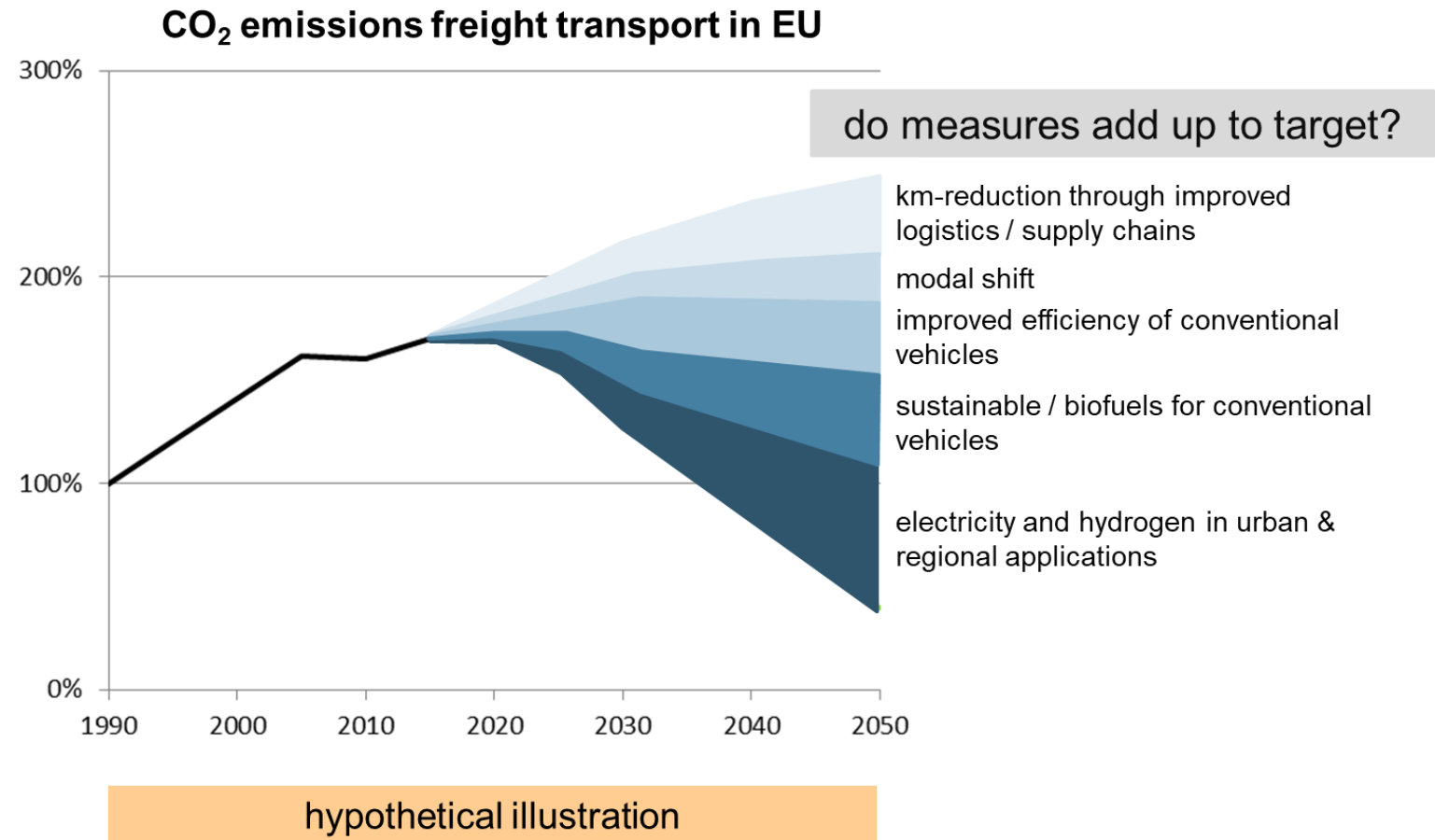
**Note:**  
CO<sub>2</sub> actual and projected emissions from heavy-duty vehicles in the EU-28.

**Data sources:** a. EEA. EEA greenhouse gas - data viewer b. DG-CLIMA. Projections on CO<sub>2</sub> from HDVs and transport

## › IT IS AND ... AND..., NOT OR ... OR ...

In trying to save the cabbage and the goat we loose the planet

- › A lot of measures available
  - › Many yield effect (too) late
  - › None can do the whole job



# › THE SECTOR WILL NOT SOLVE IT BY ITSELF

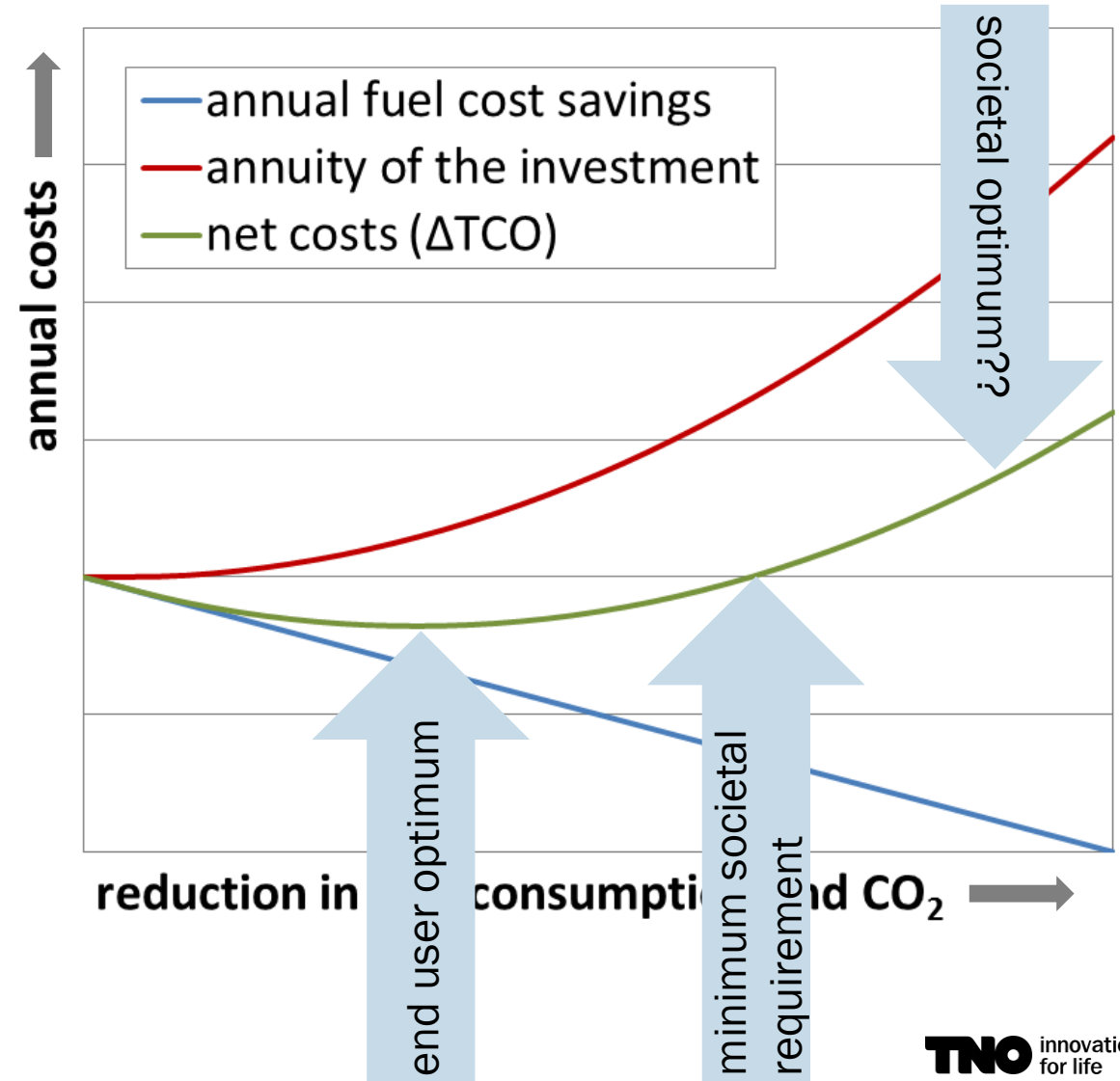
## POLICY INTERVENTION NEEDED TO REMOVE MARKET FAILURE

- › Market strives for cost optimum
  - › Cost-effective reduction measures lead to rebounds
- › Beyond cost optimum market parties suffer from prisoner dilemma
- › Government intervention needed to reach reduction levels that are required from a societal perspective
  - › Regulation => creates level playing field

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also AND ... AND ..., not OR ... OR ...

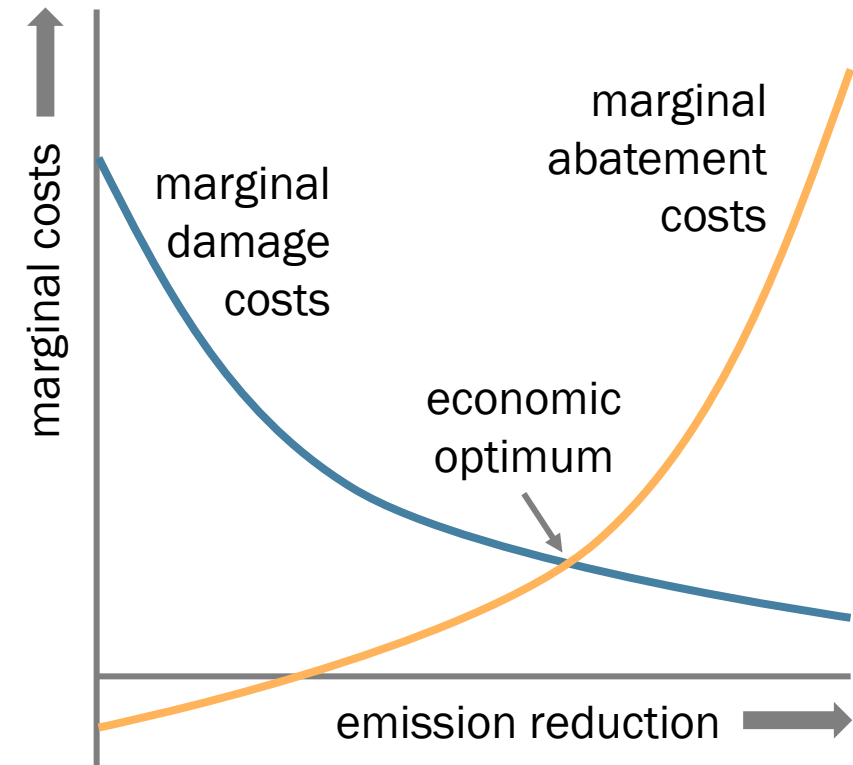
- › Pricing => shifts end-user cost curve
  - › road pricing and/or CO<sub>2</sub>-pricing
  - › helps to avoid rebounds



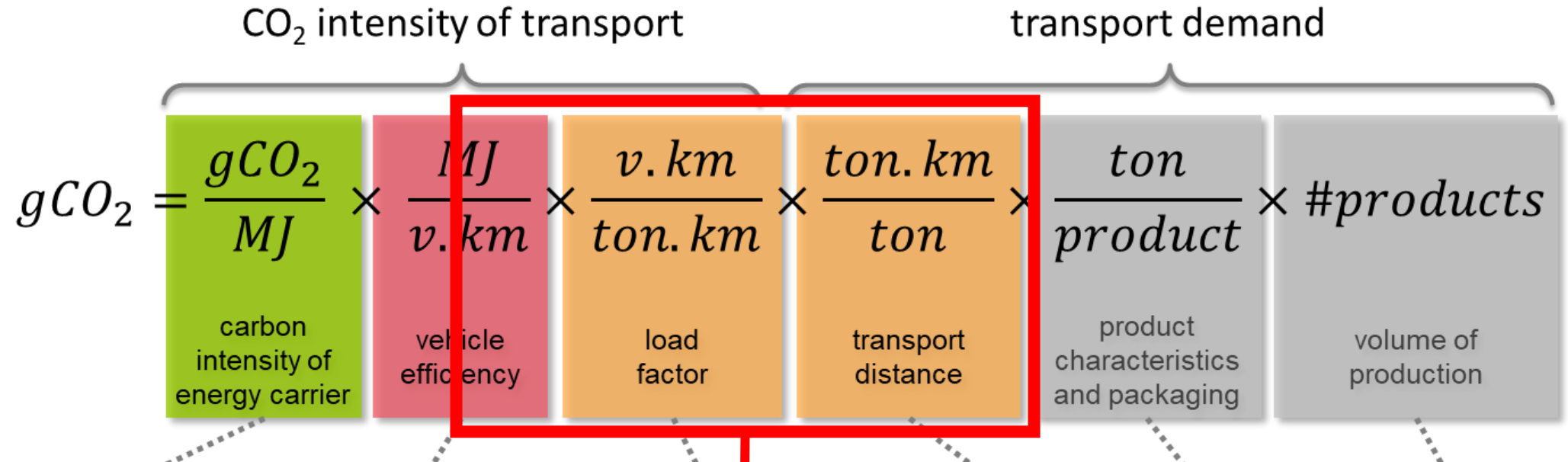
# › PRICING $\neq$ INTERNALISING EXTERNAL COSTS

## THE GOAL SHOULD NOT BE DETERMINED BY COST OF SOLUTIONS

- › The price must be set at a level that delivers the societally desired effect
  - › Take account of elasticities
- › By the way:
  - › You need a CO<sub>2</sub>-price of 100 €/tonCO<sub>2</sub> to make fuel 0.25 €/litre more expensive...



## › LEVERS FOR REDUCING CO<sub>2</sub> EMISSIONS IN TRANSPORT (SMART) LOGISTIC AND SUPPLY CHAIN INNOVATIONS

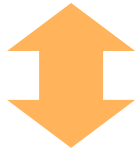


- › Smart mobility, logistic and supply chain innovations can reduce CO<sub>2</sub> through reduced vehicle kilometres
  - › How to make sure that algorithms optimise for CO<sub>2</sub>?
- › Impact on CO<sub>2</sub> only significant as long as majority of vehicles run on fossil fuel
  - › So we've got to move fast
  - › Of course benefit w.r.t. reduced demand for renewable energy remains

## › “JUGGLING COMPLEXITY”

### HOW DISRUPTIVE WILL THE TRANSITION BE?

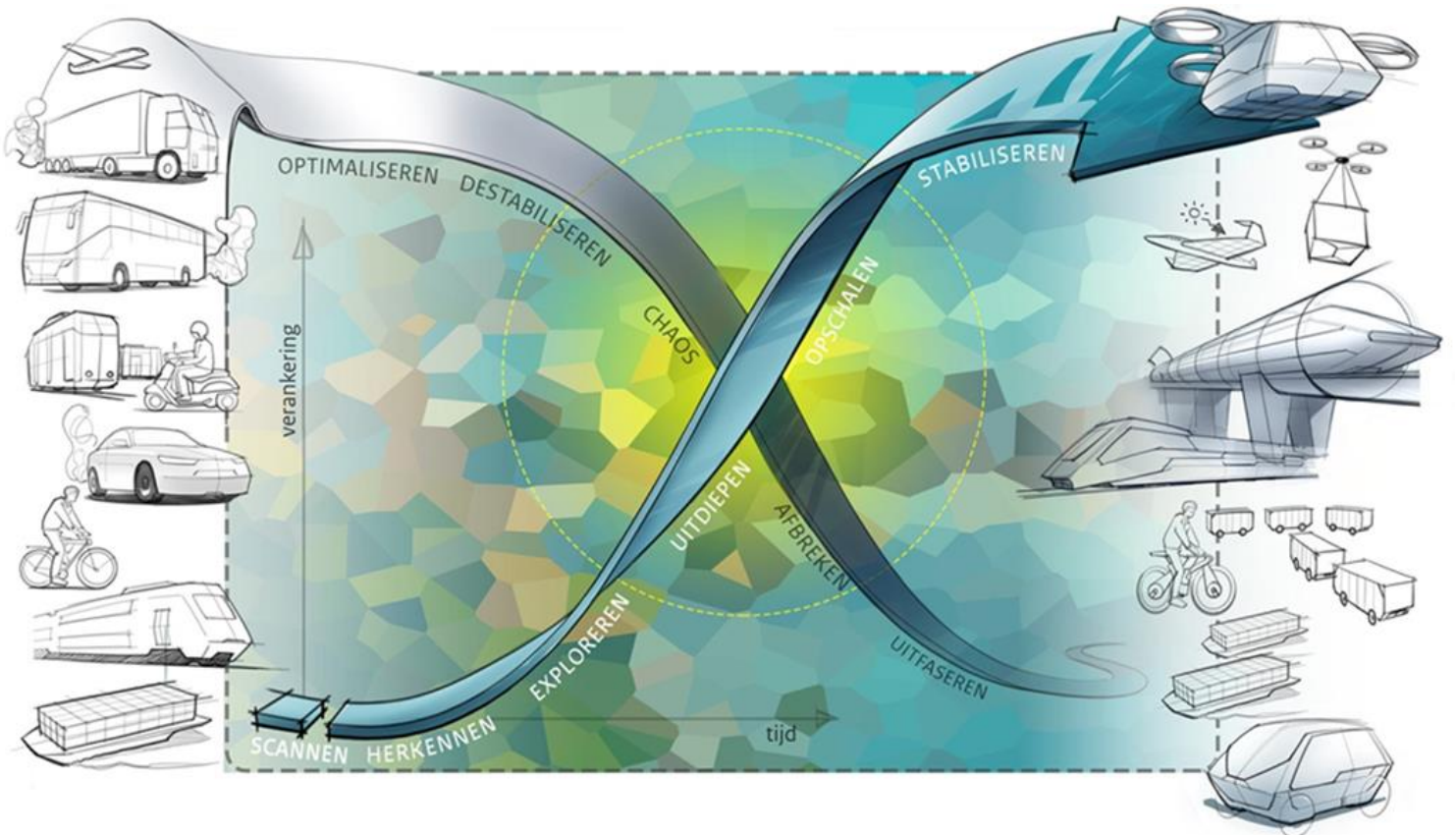
- › Decarbonize existing modes of transport by making vehicles
  - › more efficient
  - › running on renewable energy



- › Systemic changes / smart mobility & logistics
  - › new transport systems and services for passengers and goods
  - › new ways of organising cities and supply chains
  - › behavioural change

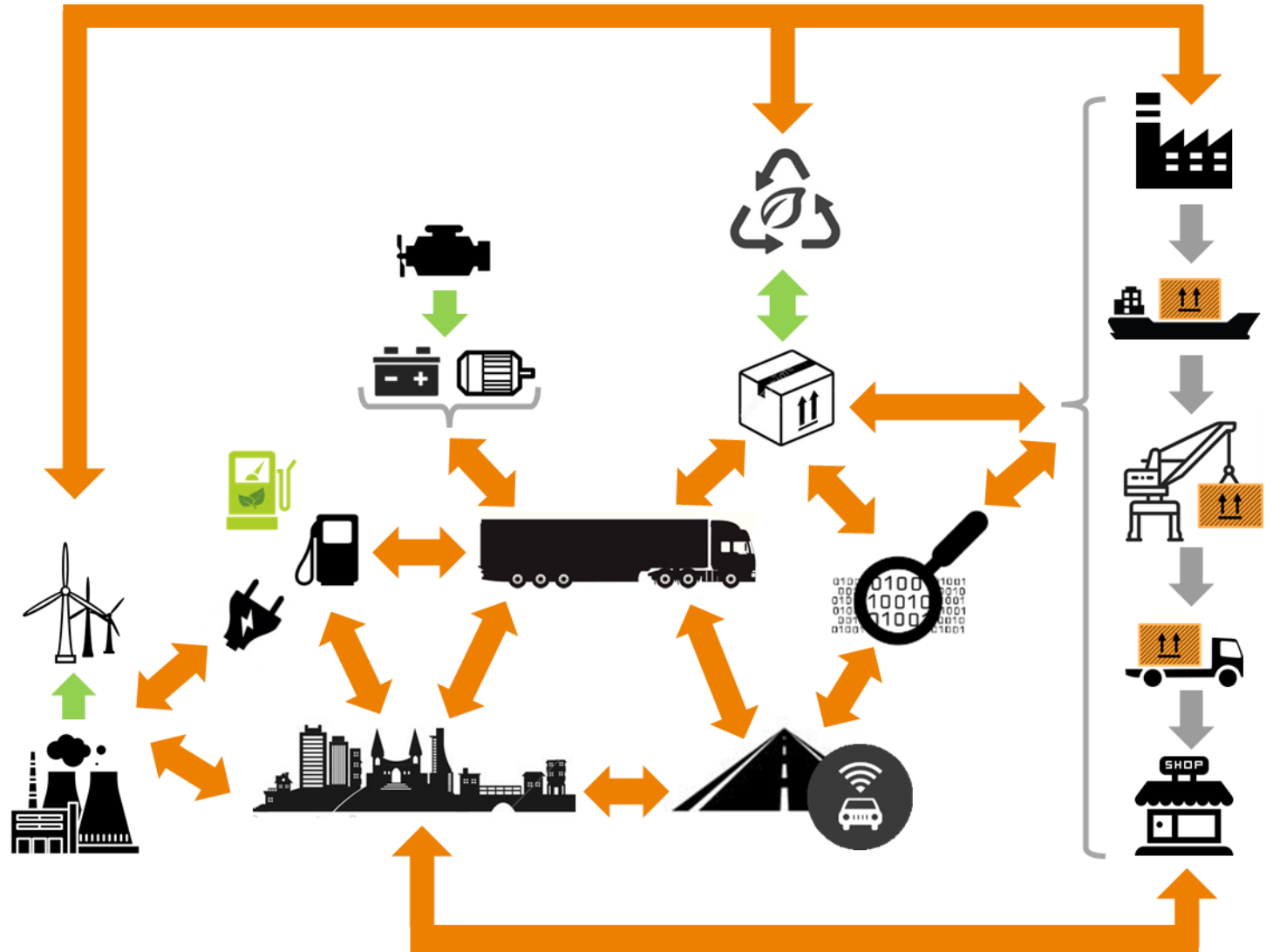
plan A

plan B



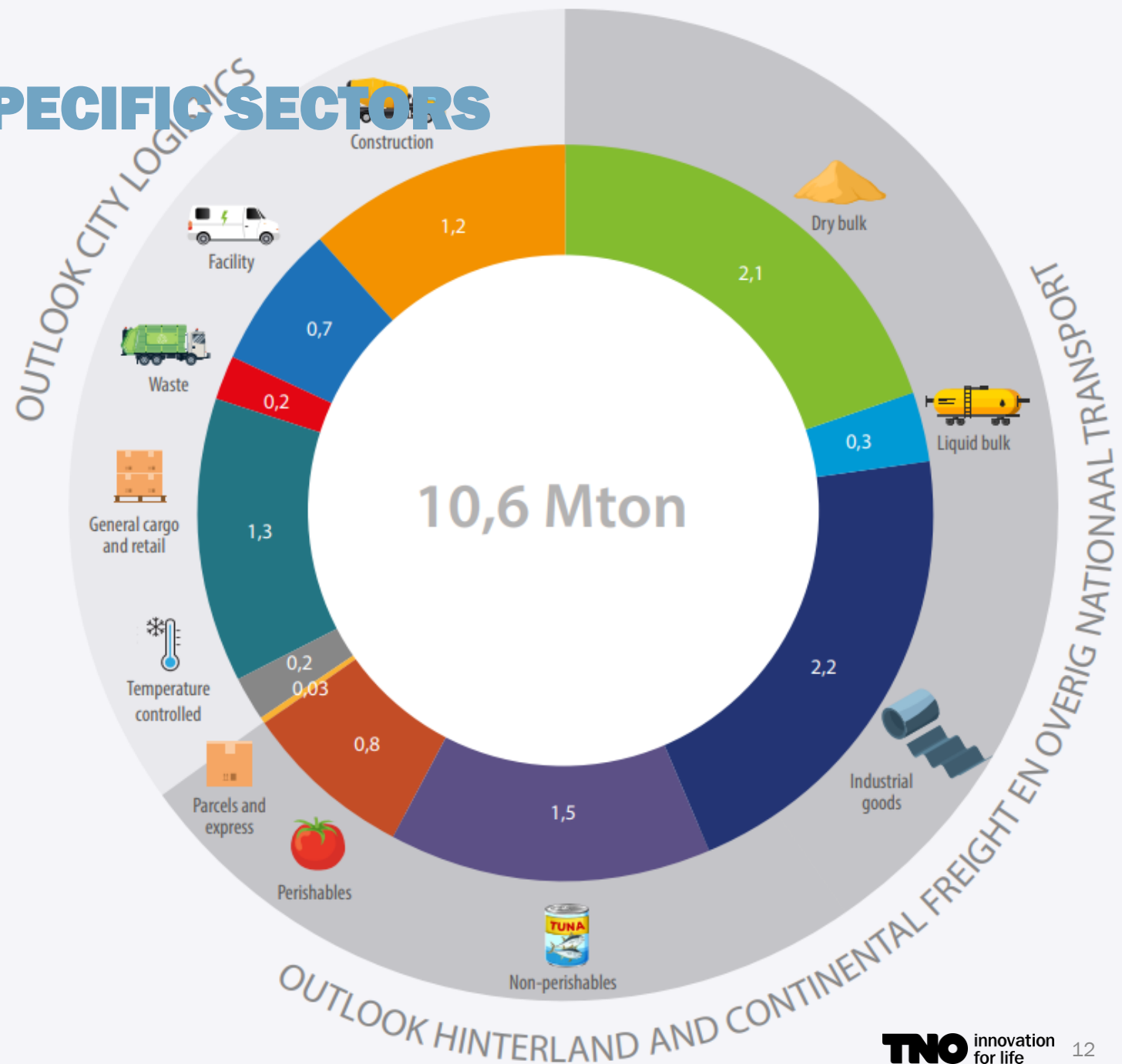
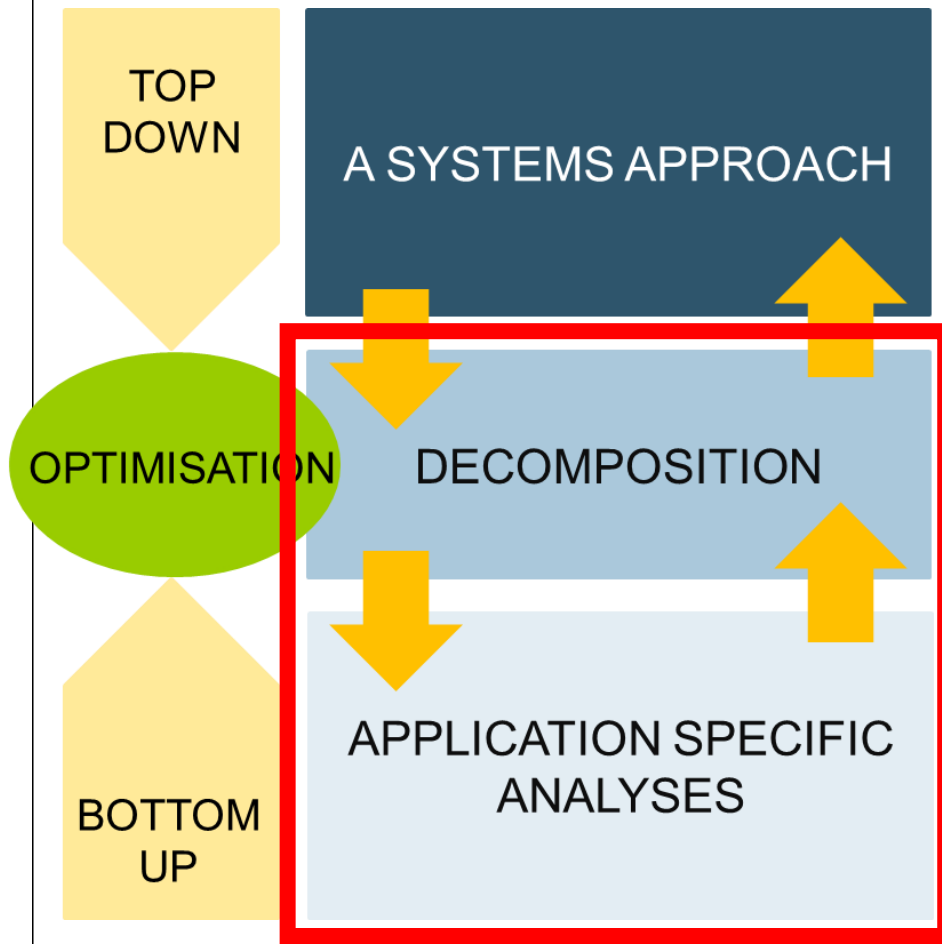
## › “JUGGLING COMPLEXITY” SYSTEMS APPROACH

- › Demand for “system thinking” should not lead to postponement of actions
- › The sector itself is very good in organising complex systems
  - › Can’t we steer the development of complex, sustainable logistics systems with simple measures?

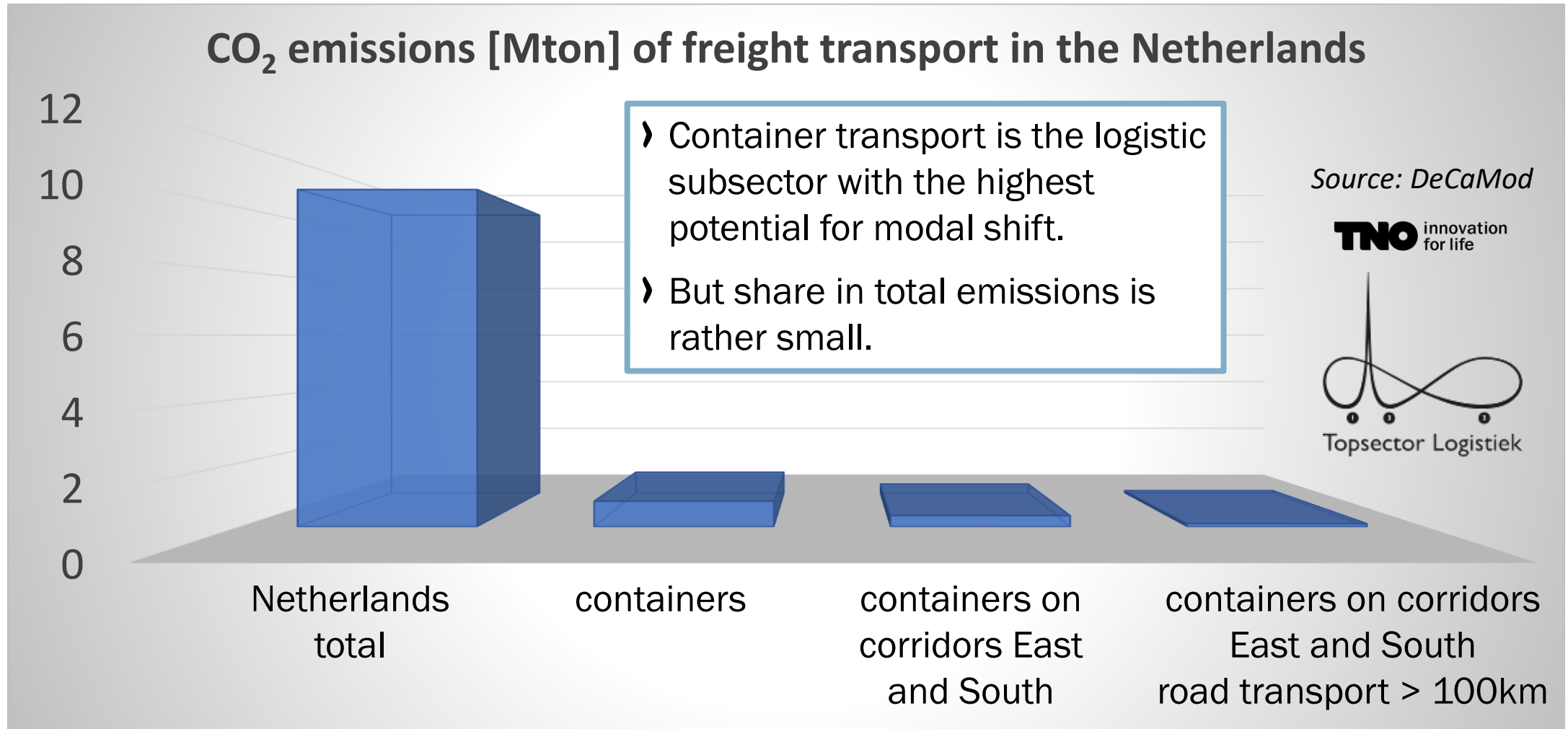


# TAILOR SOLUTIONS TO SPECIFIC SECTORS

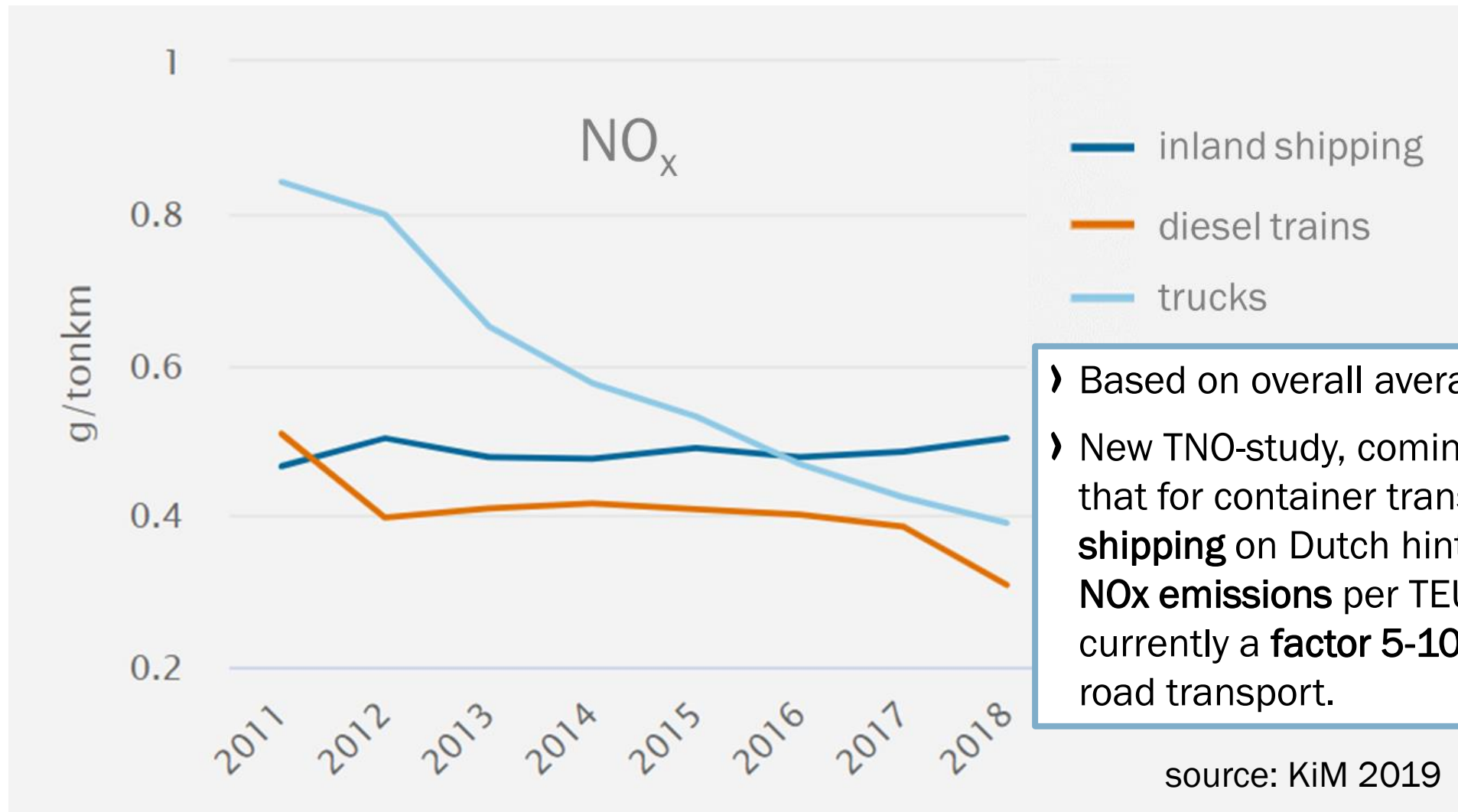
## DECOMPOSITION IS KEY



## › MODAL SHIFT: FROM ROAD TO BARGE SOUNDS GOOD, DELIVERS LITTLE



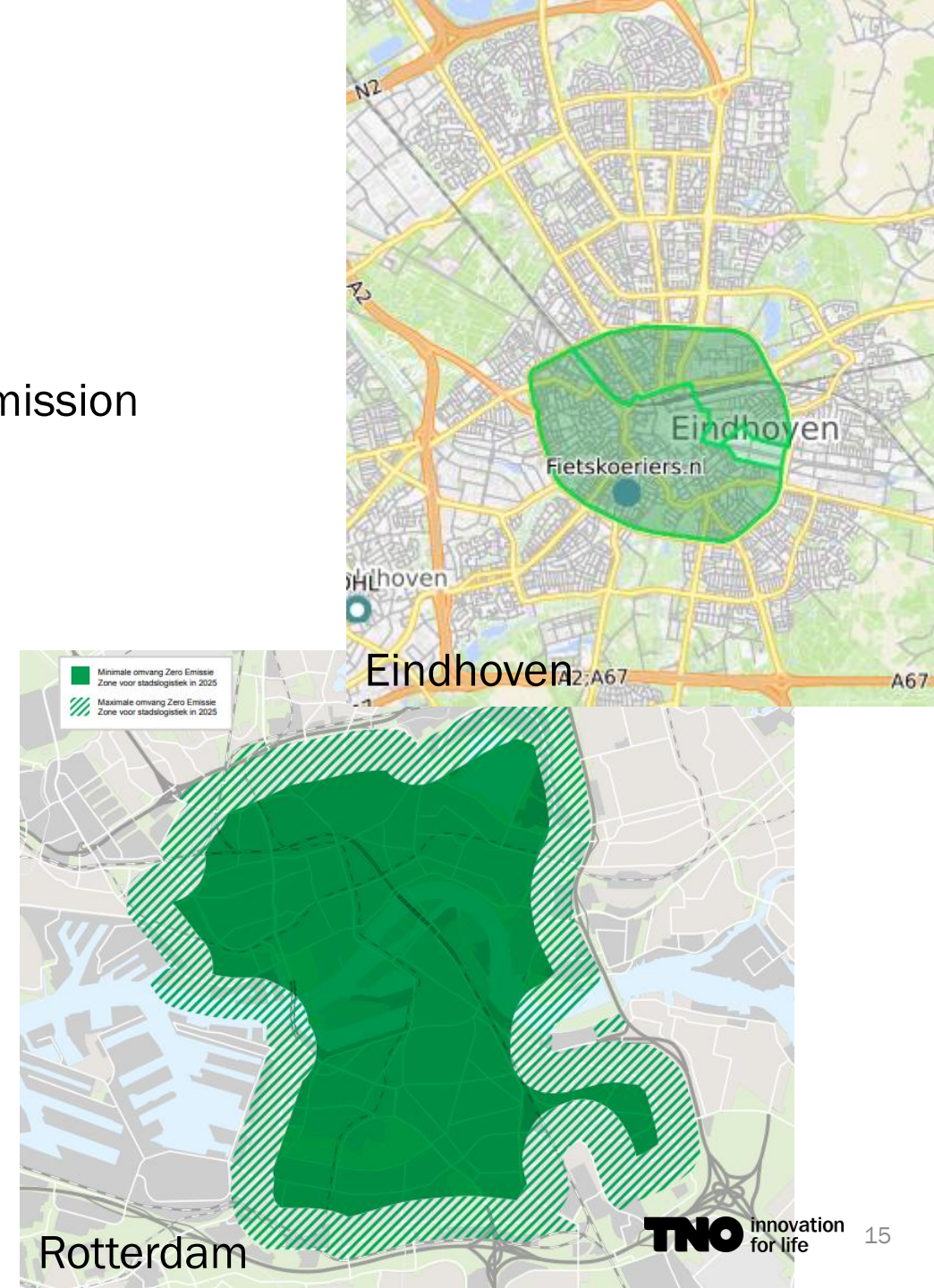
## › MODAL SHIFT : FROM ROAD TO BARGE LEADS TO INCREASED NO<sub>x</sub> EMISSIONS



- › Based on overall average emissions
- › New TNO-study, coming out soon, shows that for container transport by **inland shipping** on Dutch hinterland corridors **NO<sub>x</sub> emissions** per TEU.km GCD are currently a **factor 5-10 higher** than for road transport.

## › ZE ZONES BUT CAN BE EFFECTIVE IF BIG ENOUGH

- › Benefits for air quality are declining with Euro VI/VII
- › Regulatory instrument to promote demand for zero CO<sub>2</sub> emission vehicles
- › For significant impact on CO<sub>2</sub> a ZE-zone must be large
  - › Impact from ZE kms inside and outside the zone
- › Hubs lead to lower impact on CO<sub>2</sub> due to less ZE-kms outside zone
  - › Reduce freight traffic inside the zone
  - › But have strong spatial, traffic and environmental impacts near their locations
- › Plug-in hybrids also reduce CO<sub>2</sub>-impact of ZE zone
  - › Geofencing: How to make accountable / enforceable that consumed electricity is charged from grid?

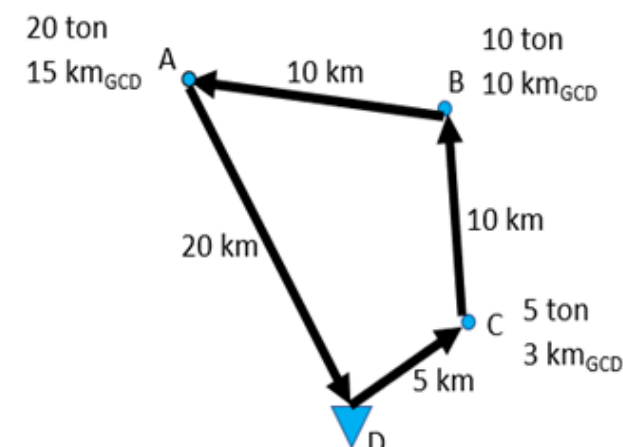
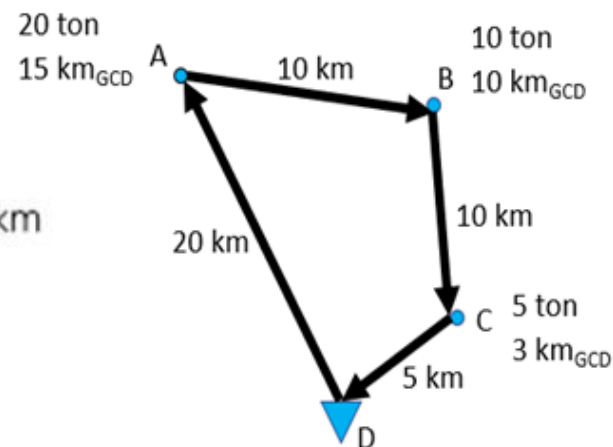
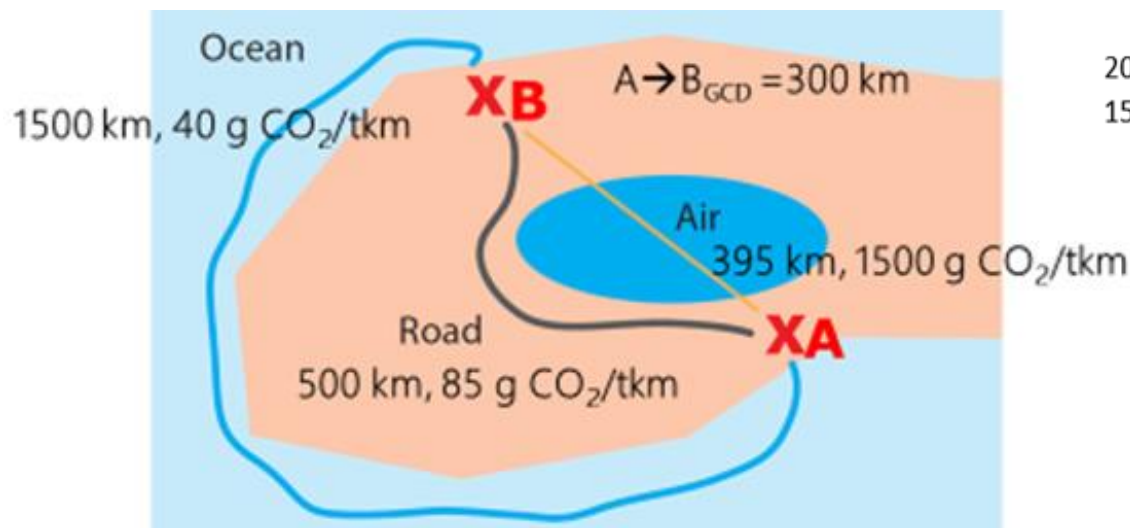


# STOP OBFUSCATING YOUR NUMBERS

## GCD IS THE BEST DISTANCE METRIC FOR CARBON FOOTPRINTING

- › Great Circle Distance (GCD) is the only correct distance metric for comparing the emission intensity of different transport modes

- › GCD is the best distance metric for allocating emissions to shipments



- › Alternative options such as Shortest Feasible Distance (SFD), Actually Driven Distance (ADD), or Planned Distance (PD) often lead to **directionally incorrect results**
- › Maximize the **use of primary data** for fuel consumption and transport performance

› **THANK YOU FOR  
YOUR TIME**



**TNO** innovation  
for life