PFAS & THE AUTOMOTIVE INDUSTRY

TOOLS, PROJECTS AND CHALLENGES

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FPP4EU Collaboration

Platform Workshop

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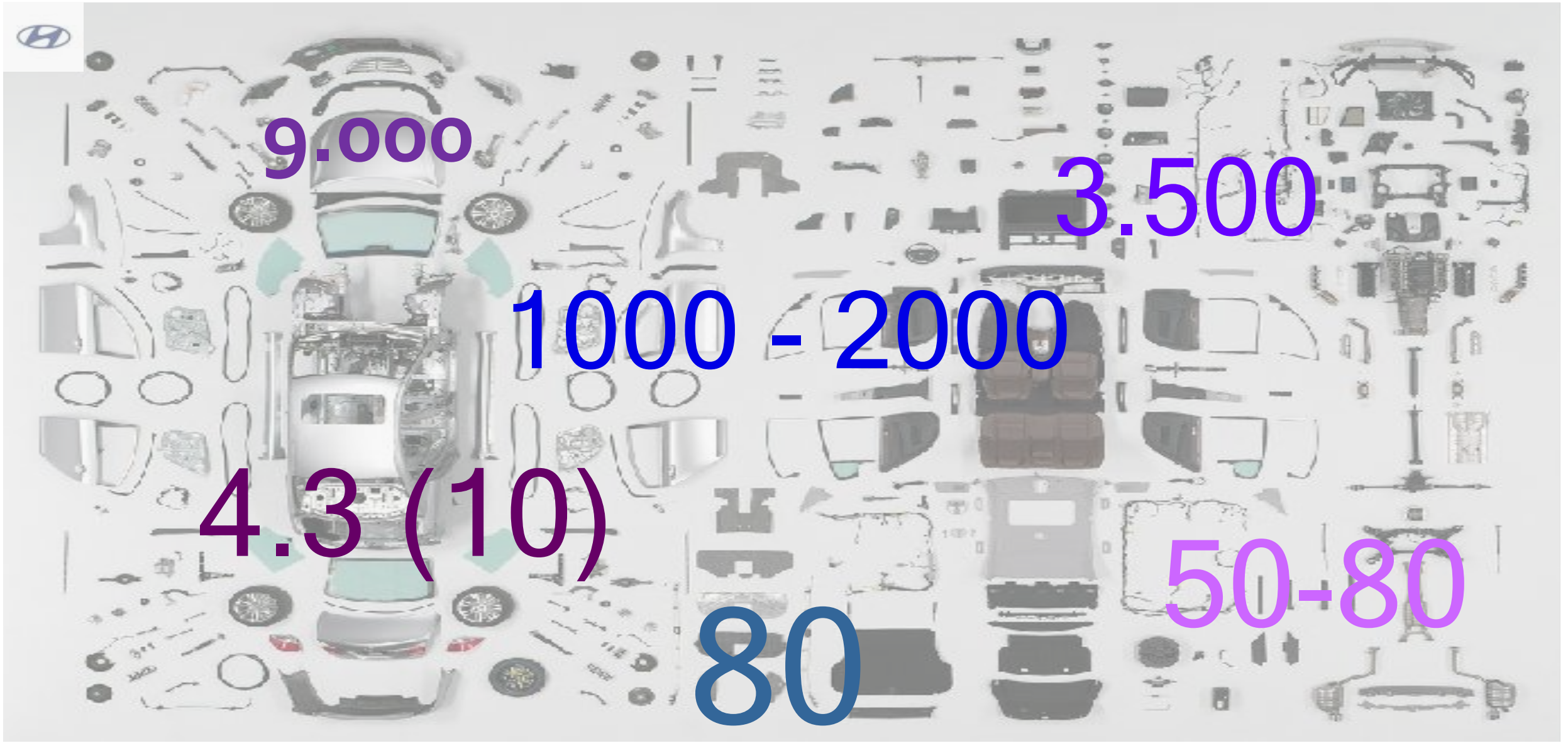
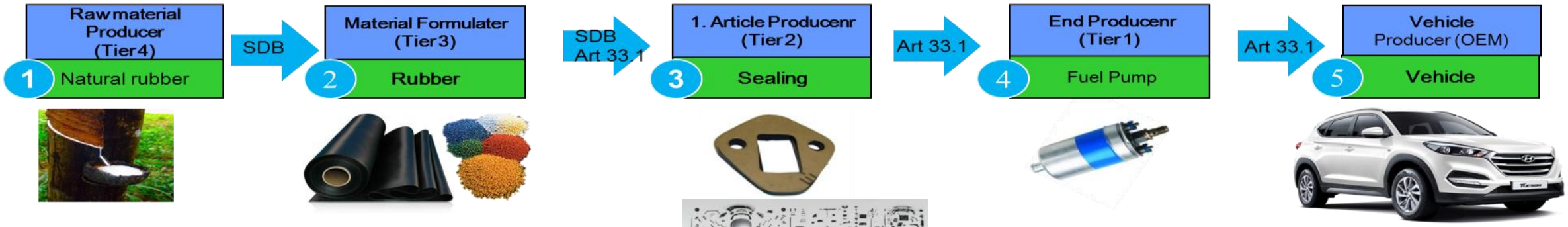
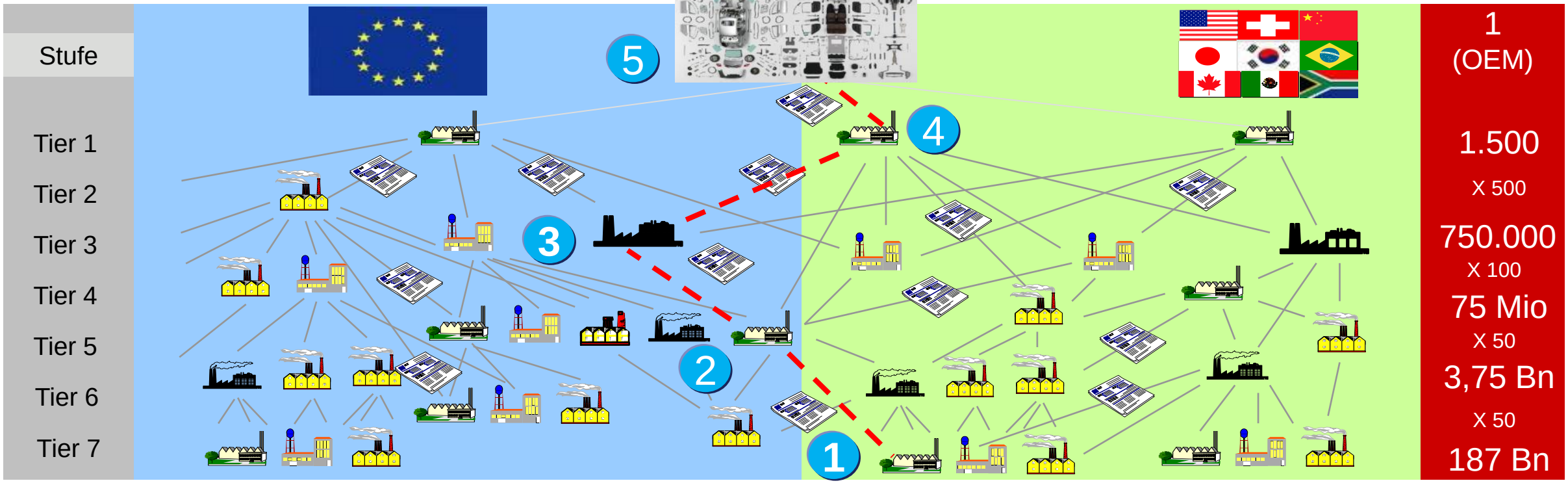
THE COMPLEXITY OF SUPPLY CHAINS AND RESULTING BUSSINES IS STILL TOTALLY UNDERESTIMATED



THE LONG WAY THROUGH A TYPICAL INTERNATIONAL SUPPLY CHAIN





IMDS - A GLOBAL ONLINE TOOL

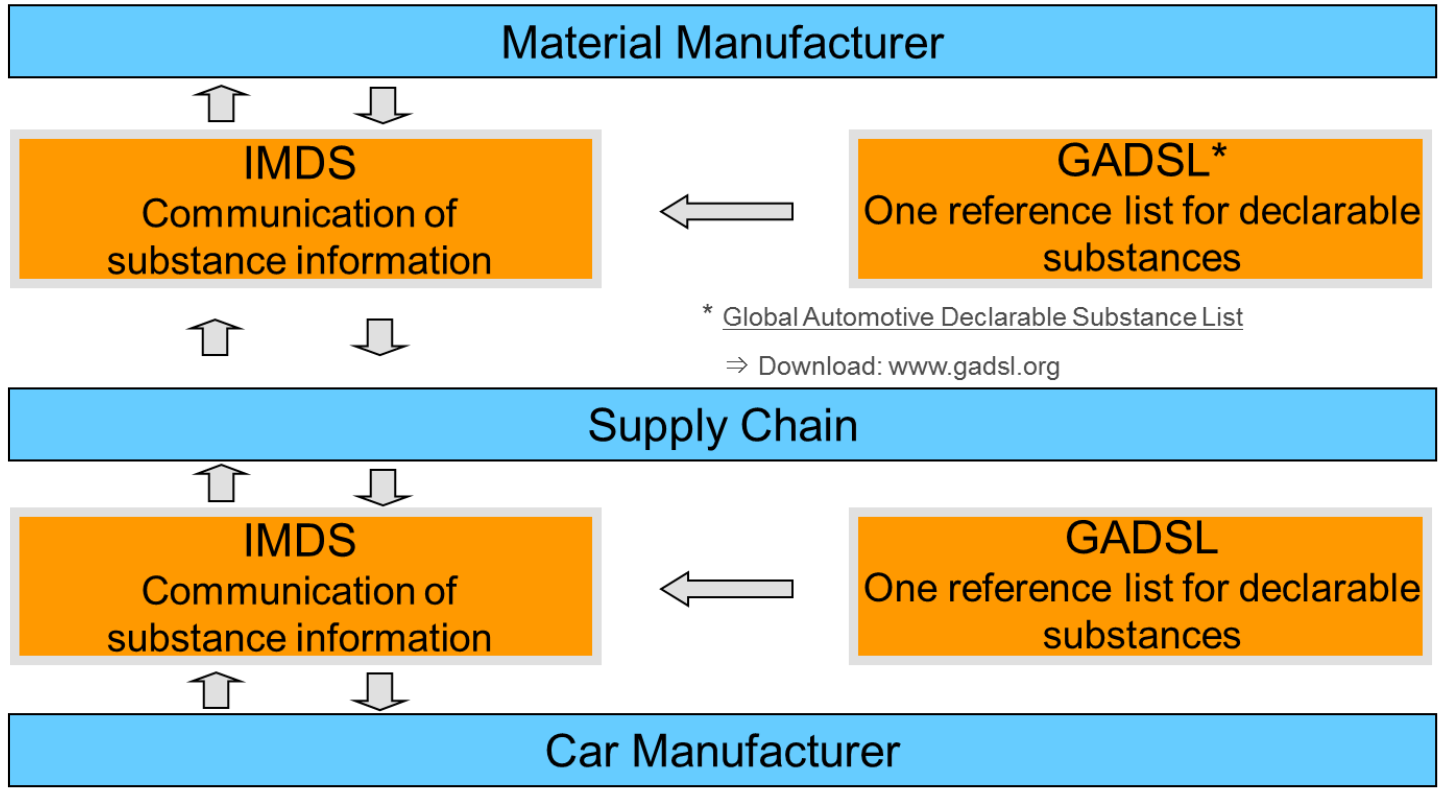
www.mdsystem.com

THE GENERAL PROCESS OF SUBSTANCE REPORTING IN THE AI

- To protect CBI, Material Manufacturers are allowed to „hide“ up to 10% of their recipe behind so called “Jokers”, e.g. “Further Additives”

BUT:

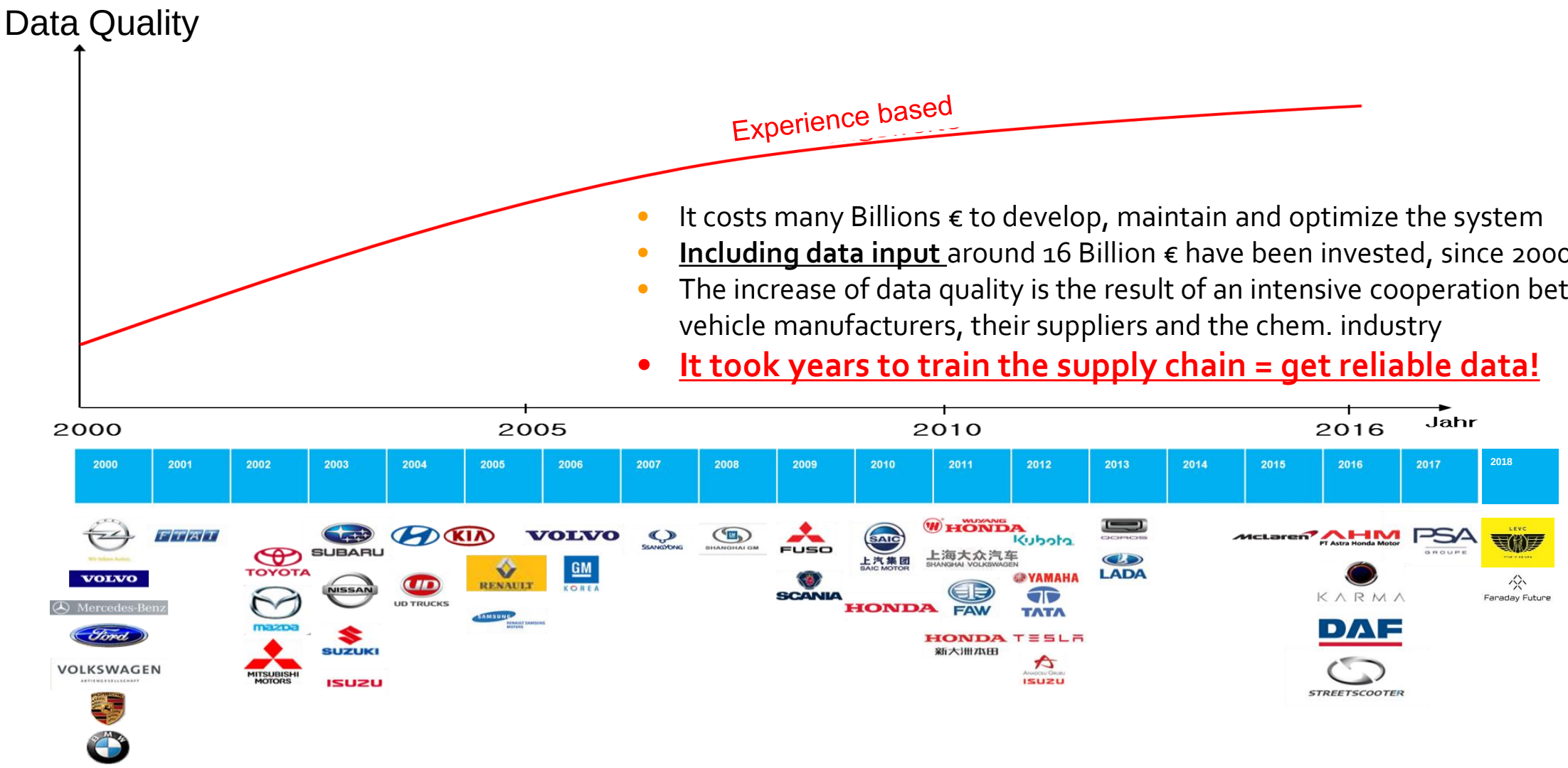
- If a substance is listed on GADSL (= prohibited or declarable), it must not be hidden behind a Joker but has to be uncovered / reported



⇒ No CBI Protection for GADSL Listed Substances

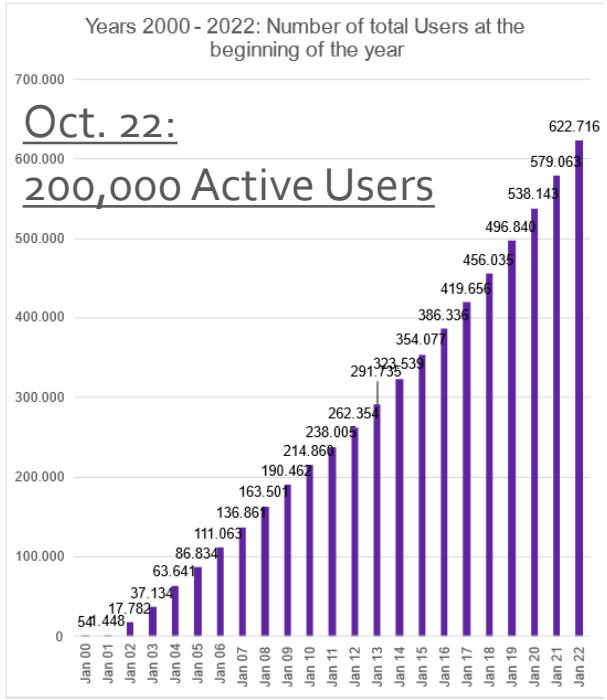
⇒ GADSL has to be absolutely correct to ensure CBI Protection and allow for proper compliance

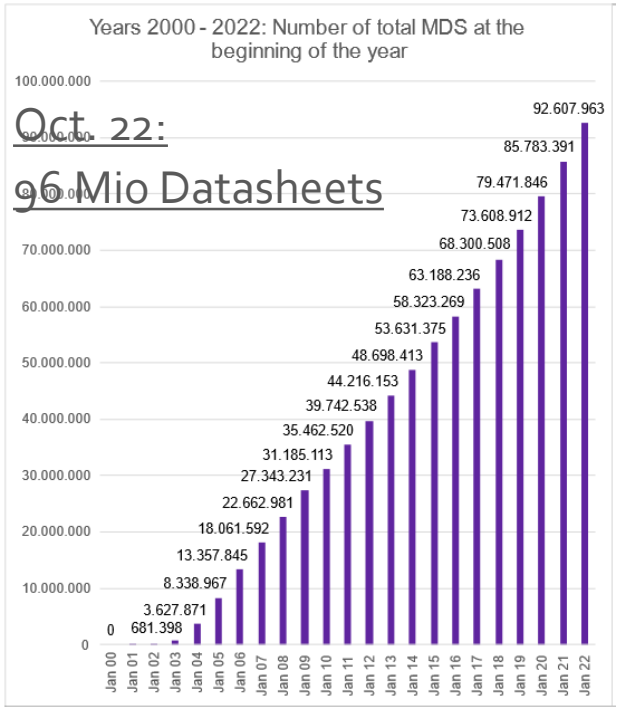
IMDS – LESSONS LEARNED

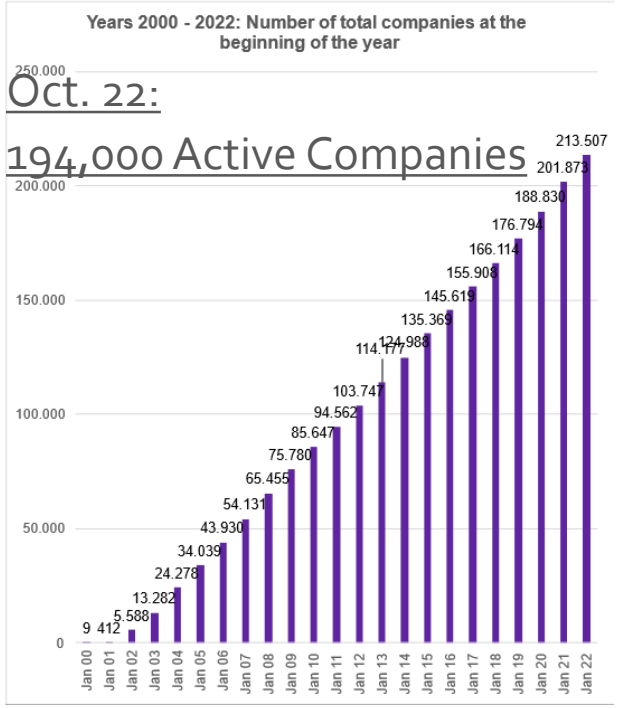


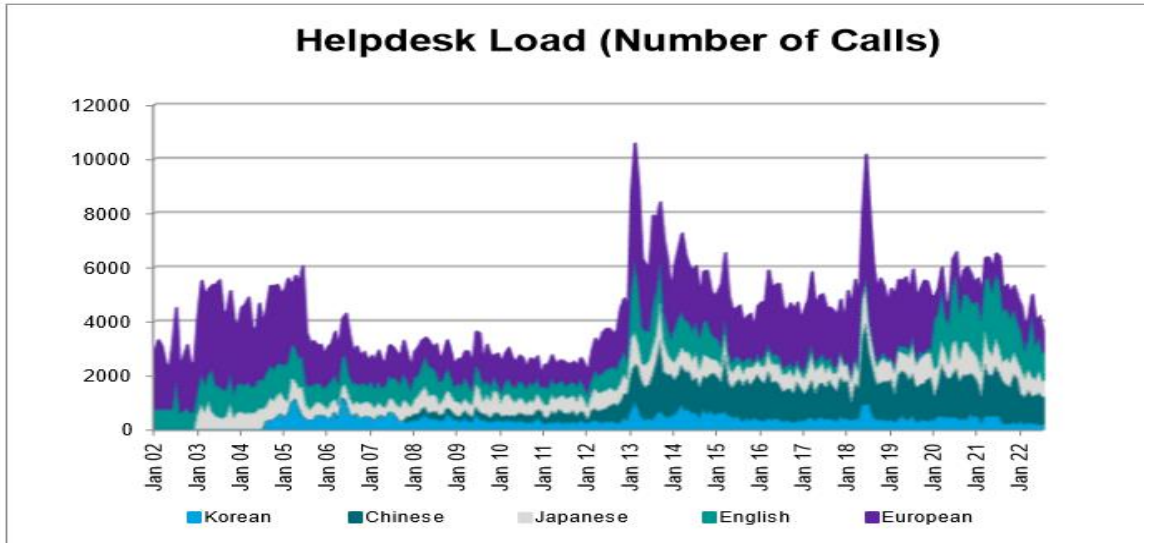
- It costs many Billions € to develop, maintain and optimize the system
- **<u>Including data input</u>** around 16 Billion € have been invested, since 2000
- The increase of data quality is the result of an intensive cooperation between vehicle manufacturers, their suppliers and the chem. industry
- **<u>It took years to train the supply chain = get reliable data!</u>**

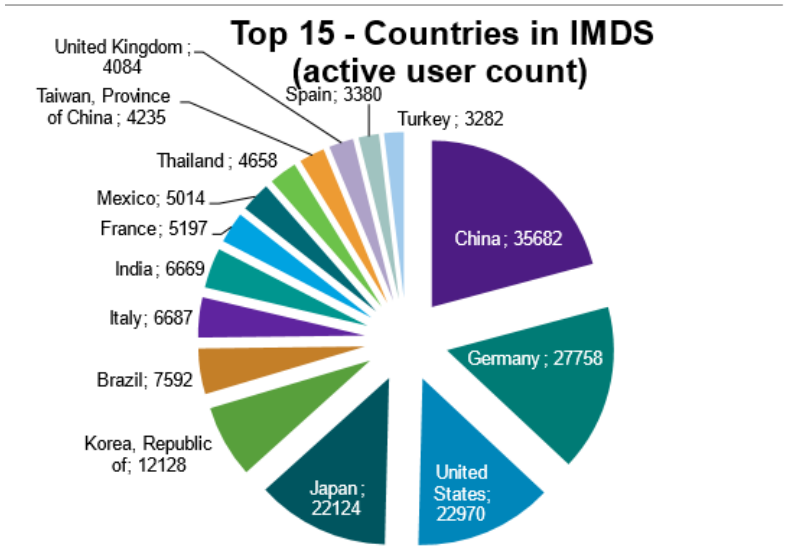
IMDS – A TRULY GLOBAL SOLUTION











ONE OF THE MAJOR CHALLENGES…

ShinShout

Data Input Quality:
Acceptable

X years

Data Output Quality:
Less Acceptable

… the update of existing data due to engineering changes on supplier side
… unintentional contaminants (e.g. PFAS, PAH, …)

AUTOMOTIVE INDUSTRY - PFAS

Summary of our major challenges:

- We don´t know exactly where…
- We don´t know exactly why…
- We don´t know exactly by whom…
- We don´t know exactly how many and how much…
- We don´t know which essential…
- We don´t know exactly which…

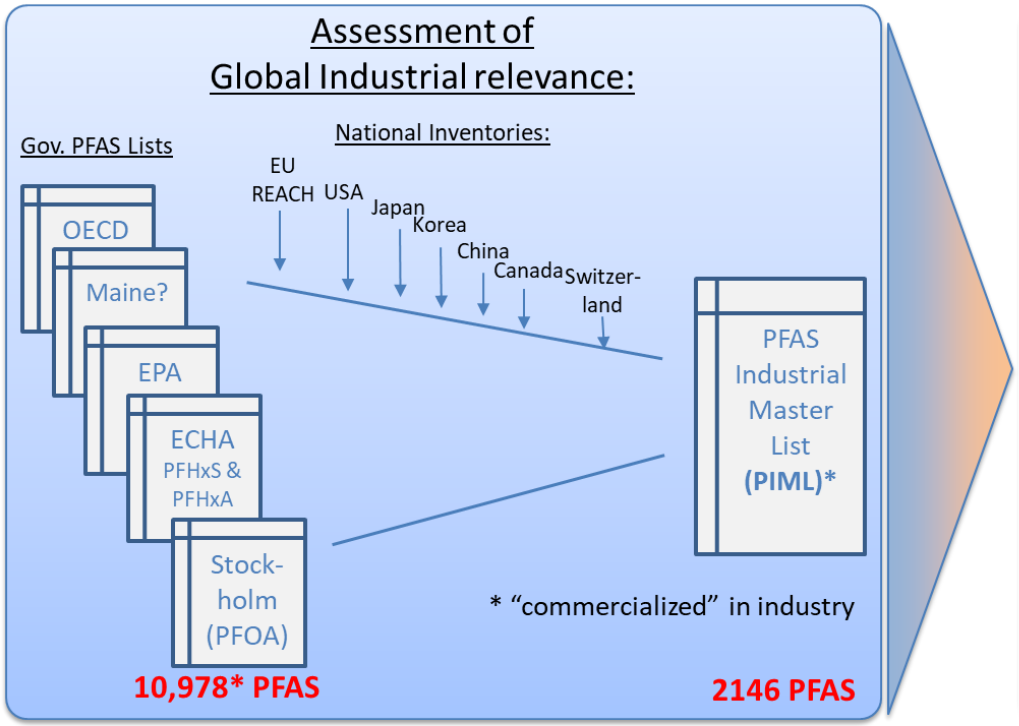
We = Automotive Industry as well as most other End-User Industries (EUI´s)

…PFAS are used in our supply chain

But according to our current limited knowledge we understand, that the PFAS restriction is a major threat to our European business

HOW TO "WHICH": PFAS IDENTIFICATION

- The current approach (under testing) to reduce PFAS only to the commercially relevant ones.
  - Process not yet approved by the responsible committees
  - Discussion also including non-automotive associations (e.g. Aerospace and Defense)



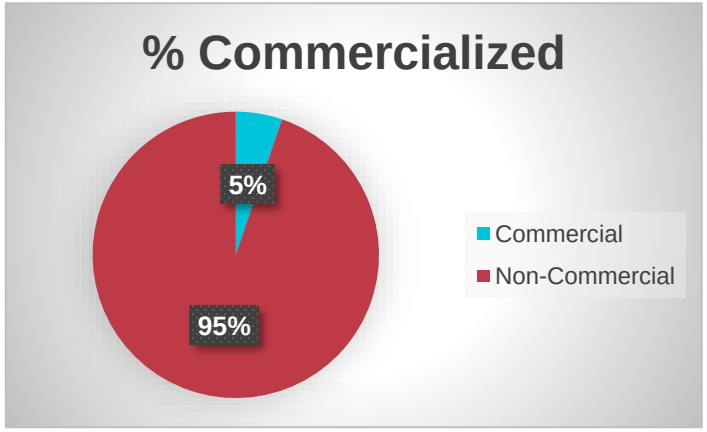
PFAS List

- Declaration threshold
  - Intentionally added including any degradation byproducts of PFAS
  - Triggered by the "US Maine Requirements"

HOW TO FURTHER REDUCE THE NUMBER OF PFAS CAS#?

Focus on Fluorochemical Manufacturers & Commercially available PFAS

- Globally 50 + chemical manufacturers of PFAS
- What are the odds of 50+ global chemical manufacturers using 4000-10,000 CAS numbers?
  - Chemical Manufacturers claim only a low percentage of CAS# are used → This is potentially credible!?
- Study indicates that only 256 (5.4%) out of 4730 CAS# on OECD list were used commercially by three diversified fluorochemical manufacturers**
- Actual CAS# not listed in published paper (may be intellectual property concern for chemical manufacturers)
- How to further reduce number of relevant PFAS? Buy-in from other sectors appreciated!



**Buck, R et al, "Identification and classification of commercially relevant per- and poly-fluoroalkyl substances (PFAS). Integr Environ Assess Manag. 2021 Sep. Retrieved on 2/4/2022 from https://pubmed.ncbi.nlm.nih.gov/33991049/

SUMMARY AND OUTLOOK ON PFAS IN IMDS

Current:

- We will inform all >150,000 global suppliers about their duty to report PFAS > 25ppb per article
- We have updated our Global Automotive Declarable Substance List (GADSL) with >2000 PFAS
  - Existing relevant data needs to be updated (hopefully)

Coming Next:

- We may add a requirement for material manufacturers to actively confirm (checkbox) that their materials are within the legal thresholds

  → Request to chemical industry and material manufacturers:
  - Which PFAS test procedures and methods are available to be referenced?
  - Are you interested in participation in this discussion?
- We have started with two external projects / studies…

How to “where”, to “by whom”, to “why” & to “how much”?

- Both CLEPA and ACEA are highly impacted by the coming PFAS restriction :
  - Many fluoropolymers and fluoroelastomers used in car and automotive devices – joints, o-ring, wire etc.
  - F-gas used as refrigerant
  - Short chain PFAS used in many products – lubricants, cleaning products, surface treatment etc.

- ACEA and CLEPA commissionned Cetim, the French Technical Center for Mechanical Industry, on two studies to enhance their knowledge on PFAS and have relevant data to submit for the public consultation:
  - A socio-economic analysis of the replacement of R-1234yf
  - A PFAS inventory on 5 selected automotive parts, focusing on short chain PFAS

- The main objective of the study is to assess the presence (or not!) of short chain PFAS in the materials and manufacturing processes of the selected pieces :
  - Chassis : Shock Absorber, strut assembly
  - Traction Battery : Battery Cell scrim binder
  - Fuel Line : Fuel injector sleeve and O-ring
  - MAC : Compressor bearing shaft, rotor, filter
  - Harness wire cable

Automotive supply chain study : PFAS inventory

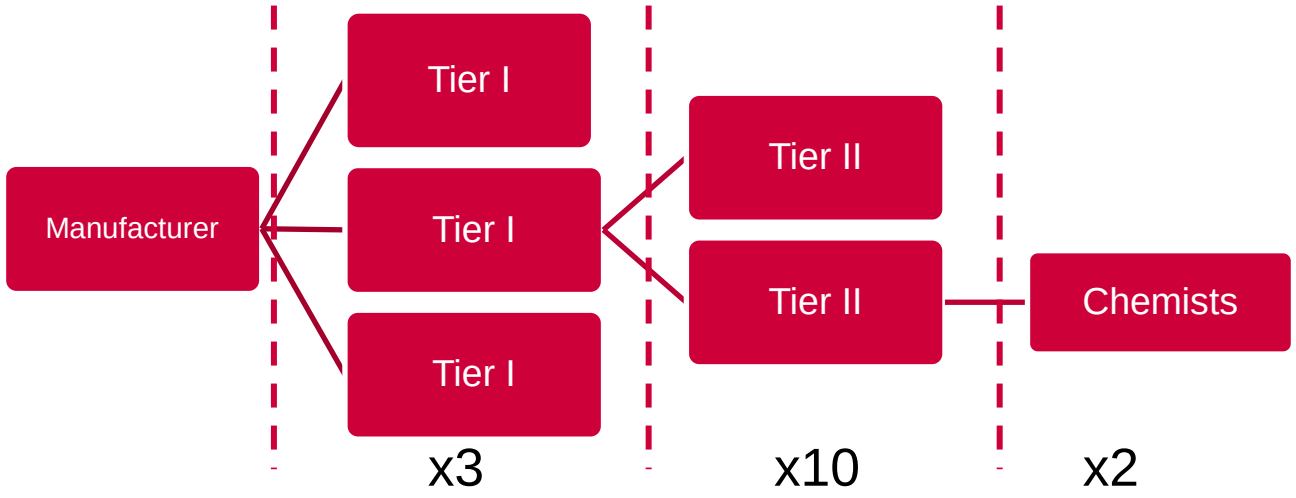
- For each parts :
  - Gathering suppliers contact information from CLEPA / ACEA members
  - Conducting interviews with tier I suppliers, check their uses of PFAS, a questionnaire was developped with ACEA
    - Reach for tier II, III etc. suppliers to assess their uses
  - Try to establish which PFAS are used, why, the quantities, the exposure, etc…
  - Data are collected and displayed **anonymously**

- Still expecting feedbacks from suppliers
  - First results will be available in december
  - Further results and feedbacks will be added once they are available to further strenghtened the study

Automotive supply chain study : PFAS inventory

Quick results overview : case of the wire cable

- ACEA established the use of FEP and PTFE in the cable
- 3 tier I suppliers contacted and interviewed
  - Thanks to 1 tier I supplier, 10 tier II suppliers responded, 16 expected to send some feedback soon
  - Chemical companies responded to sollicitation and agreed for meetings



General feedback :
-Tier I suppliers are using fluoropolymers, no short chain PFAS in the processes

-Short chain PFAS used :
- 4,4'-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]diphenol ~1,8% in rubber seal

-Other fluoropolymers identified :
- PVDF-HFP (rubber seal)
- Modified ETFE (corrugated tubes)
- MFA (corrugated tubes)

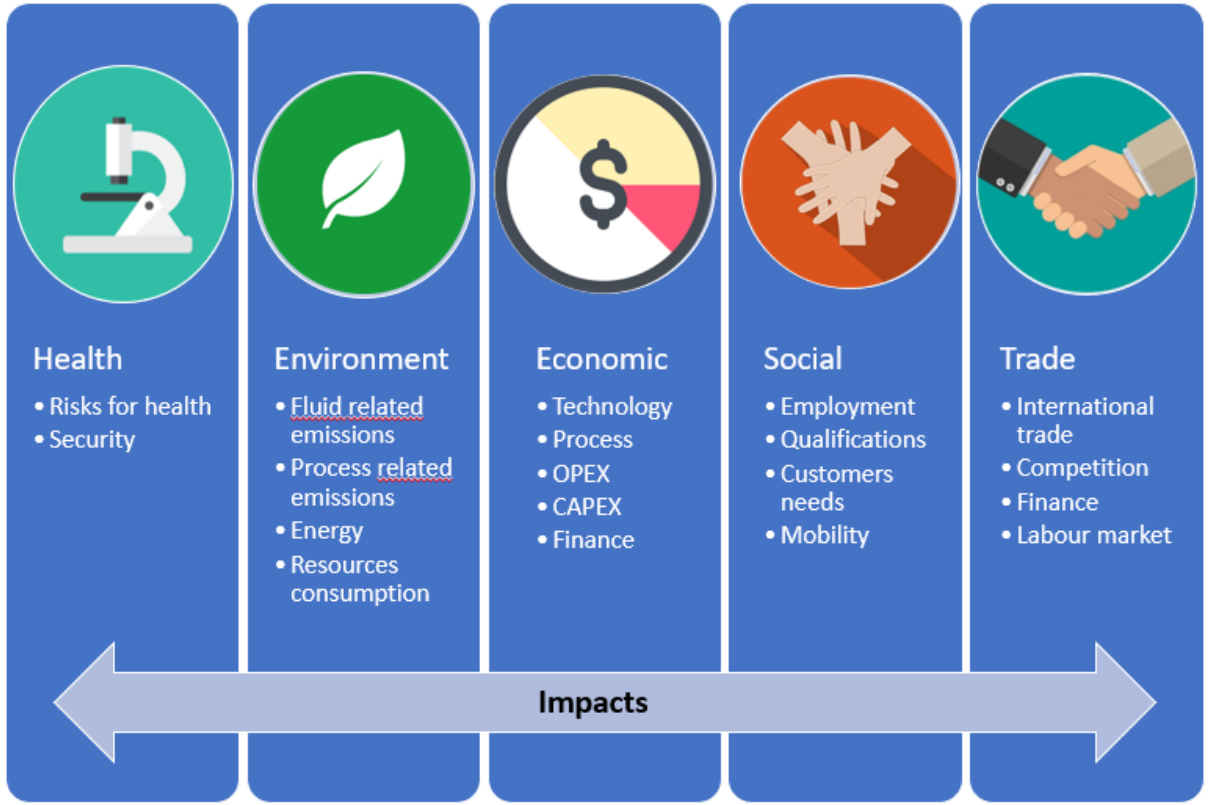
Socio-economic analysis on replacement of R-1234yf in mobile air conditionning

- Mobile air conditionning is mainly using R-1234yf as a refrigerant. It is identified as a PFAS and thus face a possible ban according to the definition given for the restriction proposal.

- In Extenso Croissance Innovation (IEIC) has been commissionned to conduct a socio-economic analysis on the replacement of R-1234yf in MAC by alternative refrigerants, especially on R-744
  - The objective is to identify and structure relevant data on the challenges for the automotive industry suche as :
    - Substitution
    - Impact on supply chain of R-1234yf replacement
    - Assessment of health impact for substitutes
    - Benefits/disadvantages for current technology and substitutes
  - A framework of the SEA was set-up to structure the data collected
    - Focus on R-744 scenario

Socio-economic analysis on replacement of R-1234yf in mobile air conditionning

- The study is structured in two main phases :
  - Analysis of available data and structuration of them
  - Further analysis of relevant data and reports
- General schedule
  - First phase done by September 2022
  - Health and environment reports deliver, commented and in revision
  - Economic, trade and social reports to be delivered in the coming weeks



Refrigerant producers → Logistic of the refrigerant → Auto-parts manufacturers → Car manufacturers → Maintenance and repairs → Retail sales of auto-parts → Car users → Recycling of end-of-life vehicles

Socio-economic analysis on replacement of R-1234yf in mobile air conditionning

- During phase 2, IEIC managed to interview several key actors of the supply chain
  - 16 interviews were conducted, including 3 auto-parts manufacturers
- Preliminary results
  - R744 based systems are larger and not sufficient enough in hot weather
    - Incompatibility between curent R-1234yf system and alternatives based systems
  - Suppliers wouldn’t be able to propose large-scale production of new systems on a mid-term schedule
  - Impact on employment is limited if investments are made
    - Mainly R&D, retrain of the labor force, aftermarket service personnel ➔ difficulties of deployment in short period of time
  - EU car manufacturers already invested for last transition from R-134a : low benefits from their technological advance on this matter
  - Technological advance gains through this new regulation is not guaranty to turn into a competitive advance on foreign markets if the latters won’t make the transition (example: R134a is still used in several areas)

Difficulties and lessons

- Data are not readily available, many scientific publications focus on health and environment impact
  - The whole supply chain for each industrial sector is affected, so they need to mobilize and share information
- Many suppliers are not fully aware of the extent the PFAS restriction will have
  - There is a need to support your suppliers and customers
  - Again, sharing data is a key point for such studies
- Timing is very short, especially on such a broad family of substances
  - Industrial and professionnal association need to carry these studies ASAP, to have some hard data to provide for the public consultation

Going for the future