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SWOT Analysis of Different Approaches for an Environmentally Friendly Vehicle (EFV)

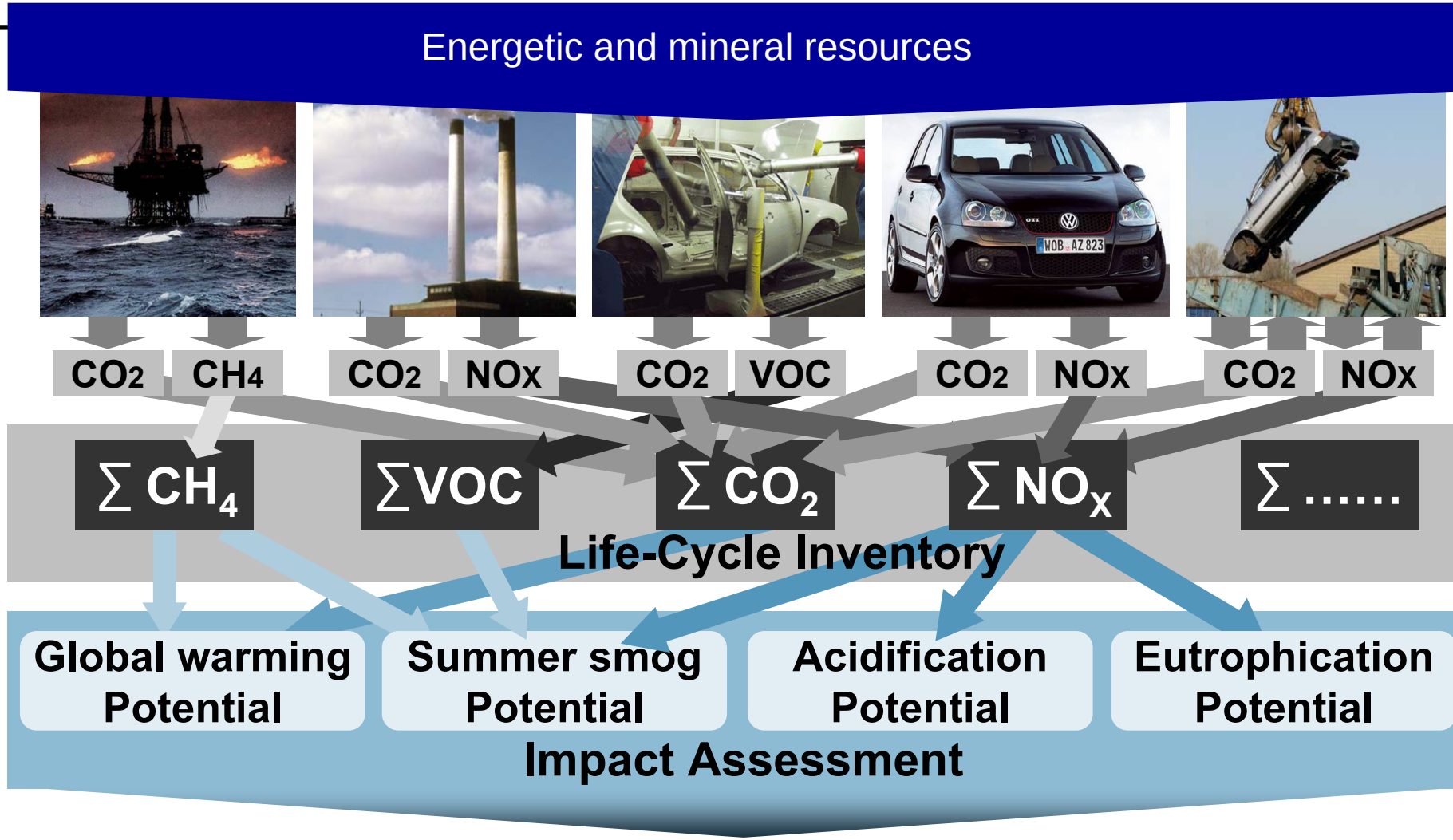
OICA Presentation to EFV Informal Group

6 June 2008

Investigated concepts

- Life-Cycle Assessment (LCA) of vehicles
- Well-to-Wheel Analysis
- CO_2 Regulation Reference Approach
- Environmental Rankings
- Green Vehicle Certification

Full LCA on Passenger Vehicles



Requirements for a LCA according to ISO 14040/44

Comparative Assertions disclosed to the public:

1. Weighting of different environmental aspects/categories or single scores shall not be applied

2. Critical Review by independent 3rd party

Full LCA on Passenger Vehicles

EXECUTING A FULL VEHICLE LCA:

- enables to evaluate cars regarding different environmental aspects
- is standardized by ISO 14040/14044 and therefore international accepted

LCA SUPPORTS SUSTAINABLE PRODUCT DEVELOPMENT BY:

- comparing alternative concepts regarding ecological aspects
- identifying connections between causes and consequences within the product lifecycle
- supporting concept decisions by statements on ecological advantages and disadvantages according to economical and technological aspects

LCA STUDIES OF DIFFERENT PRACTITIONERS VARY IN RELEVANT CRITERIAS:

- goal and scope
- system boundaries
- cut off criteria
- allocation methods
- basic data sources
- LCA software tools and data collection / sorting software

LCA on passenger vehicles - SWOT

Strength

- LCA can be a suitable method within product development to support environmentally friendly product design if simplified for internal purposes
- Internationally accepted method (ISO 14040/44)
- Integration of all actors along the value chain into the environmental discussion possible (Supply-Chain, OEM, Mineral Oil Industry, Costumer)

Weakness

- No EFV definition in itself / delivers only data that can be used for EFV definitions
- High effort for executing a LCA (time, costs, data). LCAs for passenger vehicles require several simplifications / data estimates
- Comparability given only within one study, i.e. not suitable for EFV definition
- Too complex information input and output

Opportunity

- Third party certification possible

Threat

- Complex LCA information may lead to confusion and mis-leading conclusions by customers and regulators
- Aggregation of LCA results to a single-score done although not allowed according to ISO14040 (no scientific basis for single-score/biased weighting)
- Due to complexity work may concentrate more on LCA method details than on product improvements.

Well-to-Wheel Analysis - Concept

- Life-Cycle Perspective is considered only as use-phase + fuel chain, without vehicle production and EoL phase
- Only Greenhouse Gas Emissions and Energy demand is calculated
- Other environmental aspects such as HC/NOx/CO (Summer smog / Acidification,…) were not addressed
- The approach is well known and widely accepted
- The EUCAR-CONCAWE-JRC study is limited to a generic vehicle

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Well-to-Wheel Analysis - SWOT

Strength

- Widely accepted approach

Weakness

- No EFV definition in itself / delivers only data that can be used for EFV definitions.
- High effort for execution / update.
- Environmental discussion is reduced to one single parameter (Energy/GHG).
- Well-to-wheel analysis deal with different fuel options instead of EFVs.

Opportunity

- Other environmental aspects such as emissions can be integrated.
- Streamlined Life-cycle Approach (only fuel chain is additionally considered).
- Third party certification possible.

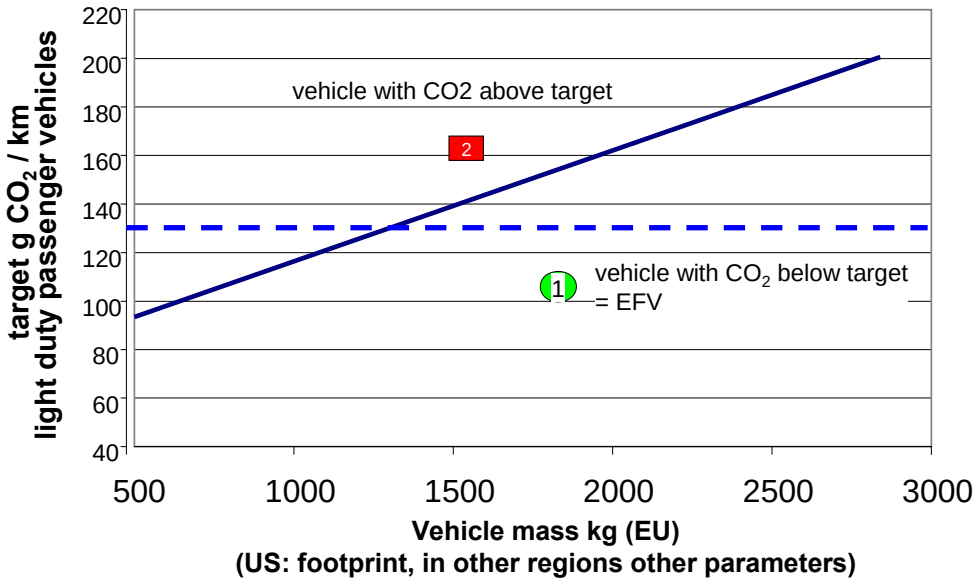
Threat

- High additional expenditure for the inclusion of other environmental aspects.

CO2 Regulation Reference Approach - Concept

- Determine CO_2 emissions (g CO_2/km tailpipe) of the individual vehicle
- Calculate the distance to legal target in the region
- Reflect any CO_2 credits linked to the vehicle

- Note: relative or absolute approaches possible



→ An EFV could be a vehicle having lower CO_2 emissions than required

→ If necessary additional criteria could be added that are important in the region (e.g. emission standard)

CO2 Regulation Reference Approach - SWOT

Strength

- Adoptable to regional conditions (regulatory targets different)
- Easy to establish
- Relating to existing regulation i.e. harmonized with and supporting legislation

Weakness

- EFV definition different in various regions.
- No EFV definition if no regulation exist.
- Environmental discussion is reduced to one aspect.
- Missing life cycle perspective.

Opportunity

- WTW CO_2-values and other items (such as emissions) or approaches can be easily included

Threat

- Long debates how much EFVs need to be better than target line by x g/km

ECO Ranking (Consumer associations) - Concept

Top Ten der VCD Auto-Umweltliste 2007/2008	
1. Honda Civic Hybrid[1]	8,34
2. Toyota Prius (Hybrid)[2]	8,30
3. Citroën C1 1.0 Advance	7,94
Peugeot 107 Petit Filou 70	7,94
Toyota AYGO	7,94
6. Daihatsu Cuore 1.0	7,90
7. Daihatsu Trevis 1.0	7,79
Volkswagen Polo BlueMotion	7,79
9. Daihatsu Sirion 1.0	7,67
10. Mazda2 1.3 MZR[3]	7,53

Bewertungskriterien

CO_2 (Typprüfwert NEFZ)	Lärm (Typprüfwert beschl. Vorbeifahrt)	Umweltkategorien			
			Belastung Mensch durch Kanzerogene	Belastung Mensch durch andere Schadstoffe	Belastung der Natur
Wichtungsfaktor 0,4	*Wichtungsfaktor 0,2*		*Wichtungs-faktor 0,15*	*Wichtungs-faktor 0,2*	*Wichtungs-faktor 0,05*
≥ 210 g/km : 0 Pkte	≥ 75 dB(A) : 0 Pkte	Otto Euro 3	9,83	7,67	8,33
≤ 80 g/km : 10 Pkte	≤ 65 dB(A) : 10 Pkte	Otto Euro 4	9,99	9,18	10
je g/km weniger als 210 gilt: 0,07692 Pkte	je dB(A) niedriger als 75 gilt: 1 Pkt	Diesel Euro 3	0	1,88	0
		Diesel Euro 3 PF	10	7,58	0
		Diesel Euro 4	5,07	6,19	5,95
		Diesel Euro 4 PF	10	8,89	5,95
		Diesel Euro 4 PFNOx	10	9,04	7,98

- Determine CO_2 emissions, noise and emission standard of the individual vehicle
- fixed allocation of emission standards to “environmental impact categories” (approved by IFEU, UBA)
- fixed weighting of CO_2, noise and “impact categories”
- Calculate eco points

→ An EFV is a vehicle having highest score

→ per category or overall Top Ten

ECO Ranking (Consumer associations) - Concept

Bewertungsschema ÖKO-TREND Auto-Umwelt-Zertifikat

Fahrzeugbezogene Bewertungskategorien:

Bewertungskategorie	Gewichtung
Fahrzeugbetrieb	50 %
Fahrzeugausstattung	5 %
Summe fahrzeugindividuelle Werte	55 %

Herstellerbezogene Bewertungskategorien:

Bewertungskategorie	Gewichtung
Beschaffung / Logistik	5 %
Produktion	17 %
Recycling	9 %
Umweltmanagement	14 %
Summe herstellerbezogene Werte	45 %
Gesamt fahrzeugindividuelle + herstellerbezogene Bewertung	100 %

- Determine vehicle specific and manufacturer specific data:
- vehicle:
  - fuel consumption on road and NEFZ
  - emission standards, noise
  - equipment: start/stop, CO_2 calculator, indoor emissions
- manufacturer/production: energy per vehicle, painting, use of recycled mater., natural fibres, elv and environmental system, ...
- fixed weighting of all categories

→ Environmental certificate only for best in class (90 from 100 pts).

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ECO Ranking (Consumer associations) - SWOT

Strength

- Easy to establish and third party verification
- Top Ten results / Labeling
- Methods with more than CO_2 and emission standards

Weakness

- Multi Criteria / impact category approach with questionable “scientific” approved weighting.
- Criteria with less benefit for environment are included, but no WTW / lifecycle-data.
- Biased methods.

Opportunity

- WTW and other items can be easily included

Threat

- Due to non-stable and non-scientific method changing criteria and weightings over time → confuse customer, moving development targets.

Green Vehicle certification (China) - Concept

- There are at least four „Green Vehicle“ certifications in China by different organizations
- The “Green Vehicle“ certificates are based on a set of requirements
- All four certificates include the evaluation factors “Emission control (OBD)“ and “Fuel consumption“
- Additionally they include at least one of the following criteria:
  - CO_2 emission
  - Curb mass
  - Exterior and interior noise
  - inner vehicle air quality
  - ELV RRR rates, Banned materials, EMI, non-CFC materials in AC system, non-asbestos material, max. vehicle speed, acceleration and climbing ability
- Often References to GB / GB/Ts given
- Implementation of two “Green Vehicle“ certifications in China (2005 and 2006)

Green Vehicle certification (China) - SWOT

Strength

- Transparent, understandable, easy to establish
- Mainly criteria that are anyhow in the development focus, legal base
- Relating to existing regulation i.e. harmonized with and supporting legislation

Weakness

- All depending on criteria selection, limit values
- Adoption to regional conditions → further market fragmentation
- Development efforts on issues out of customer focus

Opportunity

- If EFV definition can be globally agreed on the basis of legislation this could foster a global harmonization of legislations

Threat

- Different schemes create market fragmentation

CONCLUSIONS & NEXT STEPS

- EFV definition needs to investigate the complete variety of possible approaches (only few examples presented here).
- So far no approach identified as useful or acceptable.
- Further work is required to analyze approaches (additional approaches, deepening of SWOT).
- However, first fundamental questions need to be clarified to conduct a SWOT (EFV definition for what purpose (tax, GPP, development targets, …?), target audience (engineers, fleet customer, private customer, etc.)) as this determines strengths and weaknesses (customer clinics and regional studies might be required).
- It is recommended to first agree on the questions and then to develop a working plan.

Thank you for your attention