Exploring recycling
challenges along the automotive value chain

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1. Overall picture of automotive recycling

- Recycling is regulated through European legislation
- Recycling is performed to valorise used materials and parts.
- Recycling reduces CO2 emissions for raw material production.
- Recycling is balancing between positive and negative market economics

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1. Overall picture of automotive recycling (system)

1

- Individuals
- Insurances
- Retail

2 CAR DISMANTLING PROCESS

Deregistration

Depollution

Parts trade
+
Materials

3 SHREDDER

Metal separation
+
Post Sorting

4

Other

PST

Energy

Shredder residue treatment

Landfill

Residue fraction

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2. Trends in the end-of-life chain

- Increasing difference between ‘green entrepreneur’ and cliché ‘scrap yard’.
- Increasing B2B participation, decreasing ‘over the counter’.
- Internationalisation influenced by IT development.
- Dualistic business model: spare parts and valuable materials + integration with other actors.
- Anti-cyclical to economic climate.
- Suffering from decreasing level of ELV’s

  (due to increased safety, more export, illegal treatment)

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3. Trends in automotive material use

- Light-weighting of ‘traditional’ materials: steel
- Increasing application variation of metals and plastics (thermoplastics & thermosets)
- Application of composites continues
  - Laminates & Sandwich structures
  - Fibre reinforced plastics
- Research on ‘new’ metals (magnesium)
- Biobased and organics

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3. Trends in automotive material use

Material	Propulsion type and model-year			
	Internal Combustion Engine		Hybrid	Full Electric (excl batterij)
	2000	2020	2010	2010
Ferrous (Steel, Iron)	770	432	625	380
Aluminium (light alloys)	93	148	115	100
Copper (heavy metals)	46	75	40	50
Polymers	150	220	145	250
Other *	191	125	125	125
Total weight (kilos)	1250	1000	1050	955

- ✓ Decrease of steel use
- ✓ Extensive aluminium increase
- ✓ Polymers increase

* Organics, Liquids, Painting

3. Trends in automotive material use | bottlenecks

Material cycle process

1 Material Dismantling: Presorting
- ✓ Manual work less feasible
- ✓ Unsecure system – based on spot pricing

2 Shredding
- ✓ Less metal: declining volumes
- ✓ More alloy based sorting

3 Post-Sorting
- ✓ More electronics: how to get the value
- ✓ Selected number of plastics can be sorted
- ✓ Energy recovery competition

4 Production
- ✓ Vehicle complexity> interfering materials
- ✓ Reinforced: no recycling opportunity
- ✓ Limited structure for plastics recycling

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4. Trends in automotive design & parts

- Vehicle size and weight increase is **slowing down**, due to consumer demand + political effort
- **Diversification** of powertrains, more fuel efficiency
  ICE, (..) HEV, EV, Fuel cell
- Decrease **of metals** and increase of (variety of) polymers for structural purposes, to reduce CO2 emission
- Increased level of **electronics**, to meet safety and consumer demand

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4. Trends in automotive design & parts | bottlenecks

Parts cycle process

1 Parts dismantling

- ✓ Only parts with immediate value
- ✓ Lack of industry wide certification / warranty
- ✓ Undeveloped battery dismantling structure
- ✓ Increasing internationalisation requires global approach from dismantlers.
- ✓ More safety = less supply and need
- ✓ Increasing variation of components

2 Retail (garages)

- ✓ Logistics from dismantler to retail insufficient
- ✓ Acceptance low by public and retail?
- ✓ More plastics: shift of competences
- ✓ Unlocking parts databases not developed
- ✓ Retail not structurally offering reused parts

3 Stakeholders

- ✓ Limited acceptance by leasing
- ✓ No other incentive for resource efficient repair than cost saving.

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5. The IDEAL state of the art end-of-life chain

- Materials which can be **traced** back along the value chain
- Where possible, avoiding materials which **counteract** the recycling system
- Vehicle **composition** matching to the practical recycling system (if possible vis-a-vis Life phase issues)
- Transparent **data flow** on European movement of the vehicle.
- A clear **determination** of the ‘waste status’ of the vehicle.
- Reuse of valuable components – **competitive** to new.

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5. The IDEAL state of the art end-of-life chain

- Cost-competitive **recovery** of (all) materials supported by all stakeholders.
- A sound monitoring structure of **batteries**, based on both reuse and recycling principles.
- A solid **data stream** of recycling chain performances.
- EU **harmonisation** on Member State ELV implementation.
- An **incentive** on resource efficient repair, manufacturing and production

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6. A proposed R&D roadmap along the value chain

Main roadmaps	Area
1) Manufacturing and recycling process optimisation	Technological
2) Material innovation and life-cycle technology	Scientific
3) Crossborder chain management and data transfer	Organisational
4) Consumer behaviour and public influencing	Societal
5) Cost calculation and economic development	Economic
6) Level playing field and regulatory harmonisation	Regulatory

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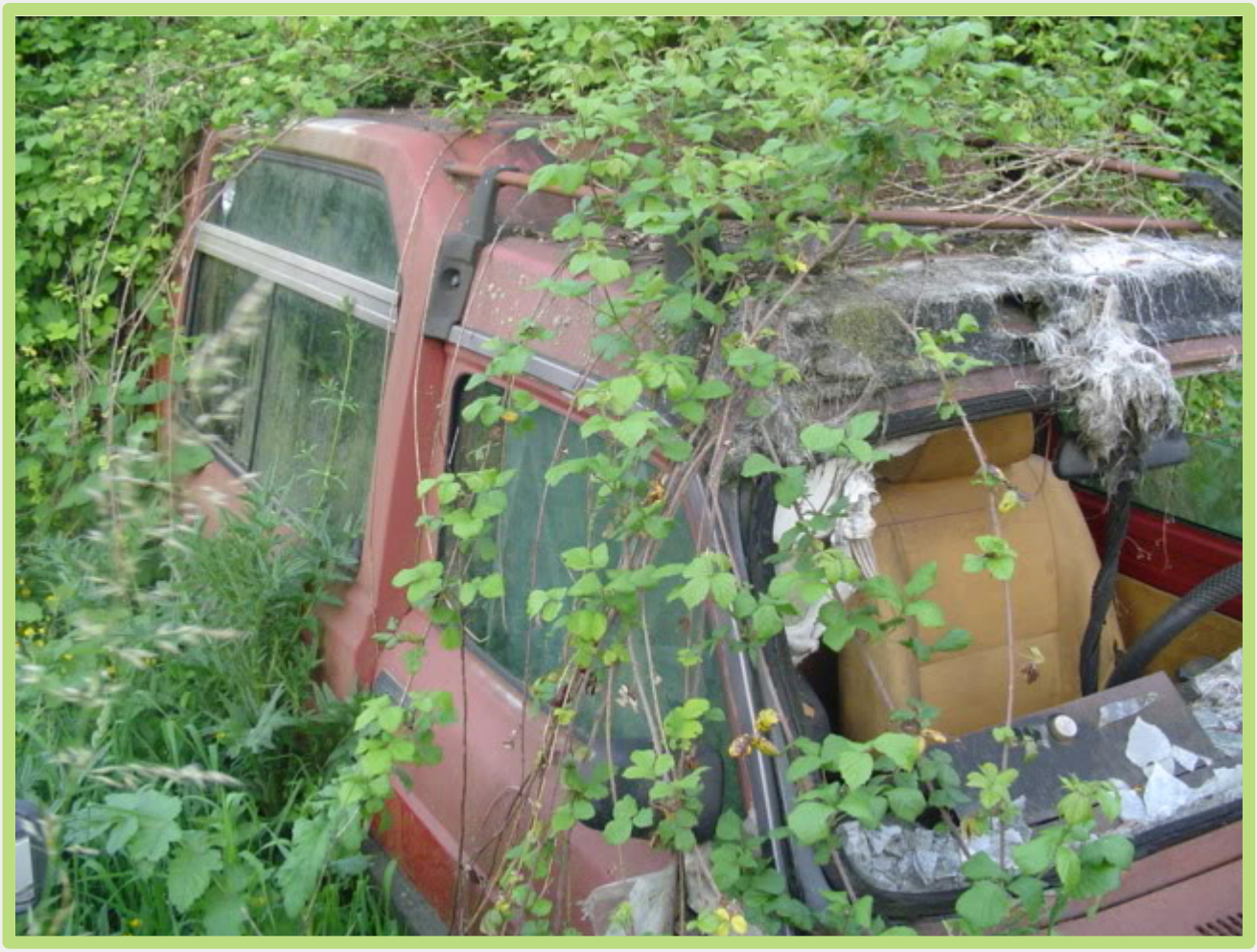

Thank you!

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