



Extended Producer Responsibility in the aviation sector:

Lessons learned from automotive and shipping
industry

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Aviation sector in figures

- Basically two manufacturers: Boeing / Airbus
- Production volume 2000 per year
- Retirement volume 200 per year
- Passenger growth 4-5% per year
→ **Doubling of air traffic in 2020!**
- Lifespan (20-30 years) is decreasing
→ **Number of retired aircraft is increasing rapidly!**

Strategic agenda (vision 2020)

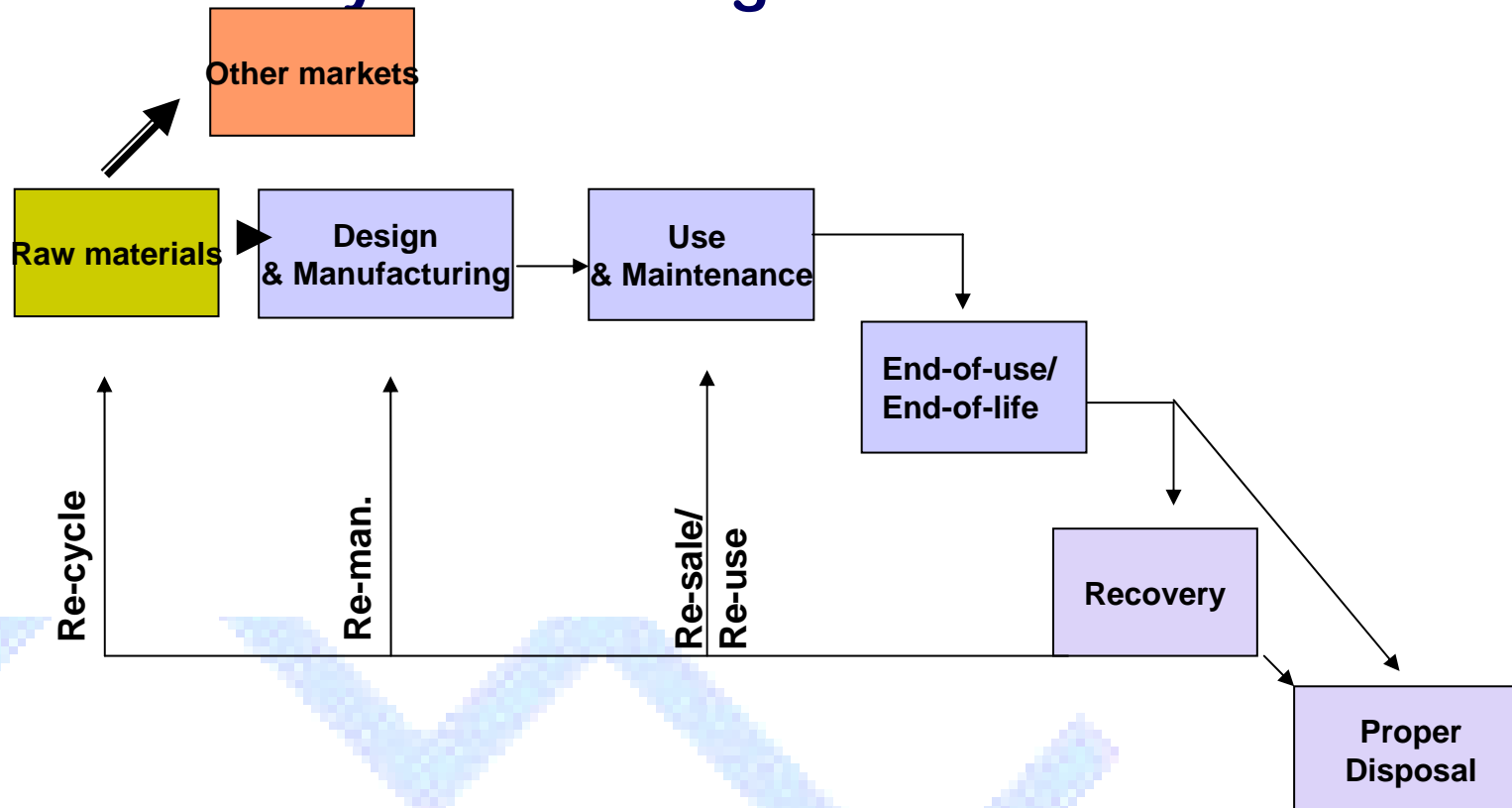
Advisory Council for Aeronautics Research in Europe (ACARE):

“The ambition to provide more affordable, **cleaner**, safer and more secure **air travel** determines the major challenge areas.”

“the challenge of meeting continually rising demand whilst demonstrating a sensitivity to society’s needs by **reducing the environmental impact of** operating, maintaining, manufacturing and **disposing aircraft** and associated systems” - **ACARE, 2002**

Extended Producer Responsibility (EPR)

- Extension of the “Polluter Pays Principle”
- The producer is responsible for their products over the entire life cycle including end-of-life.



EPR for Aviation sector

- What are possible impacts of EPR on sustainability of the aviation sector?
- Can legislation play a role?
- What would be relevant/reasonable policy parameters?
- How do we transition to truly sustainable operations?

Parking of aircraft

- **12% of total fleet in storage**
- **Drivers:**
 - Seasonal demand
 - Bankruptcy
 - Permanent retirement
 - Speculation



Financial loss of parking

- **Parking costs up to € 4000,- per month, depending on maintenance activities**
- **Deprecating costs about € 8500 per month**



Current recovery opportunities

- Re-introduce in flight schedule
- Re-sell to other party
- Disassemble for reuse
 - Engines, landing gear, wings, tail pieces, fuselage
- Dismantle for recycling/proper disposal
 - Removing hazardous materials: asbestos, hydrolic fluids, lubricant oils, depleted uranium
 - Recovering materials:
aluminium alloys → needs only 5% of energy input as compared to new production, while CO2 output is only 4%.

Current recovery initiatives: Airbus

PAMELA: Process for Advanced Management of End-of-Life

- Launched in 2005
- 1 site: Tarbes, France
- Partnership with SITA, EADS and regional government (France)
- Co-funded by the European Commission
- **Target: recovery at 85%-95% by 2010**

Current recovery initiatives: Boeing

AFRA: Aircraft Fleet Recycling Association

- Launched in 2006
- 2 founding operating sites: Evergreen Air Centre (Arizona) and Chateroux Air centre (France)
- Members from 3 continents (recyclers, technology providers, research, ...)
- Industry-funded
- **Target: Developing best-practice standards**

AUTOMOBILE & SHIPPING SECTOR

EOL practices and regulation

Impact on sustainability

- New markets
- Customer loyalty
- More turnover
- Lower costs

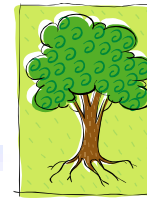
- Less need for raw materials
- Less waste
- Less emissions

- employment
- Better services
- Better products
- Better environment

PROFIT



PLANET



Triple
bottom line

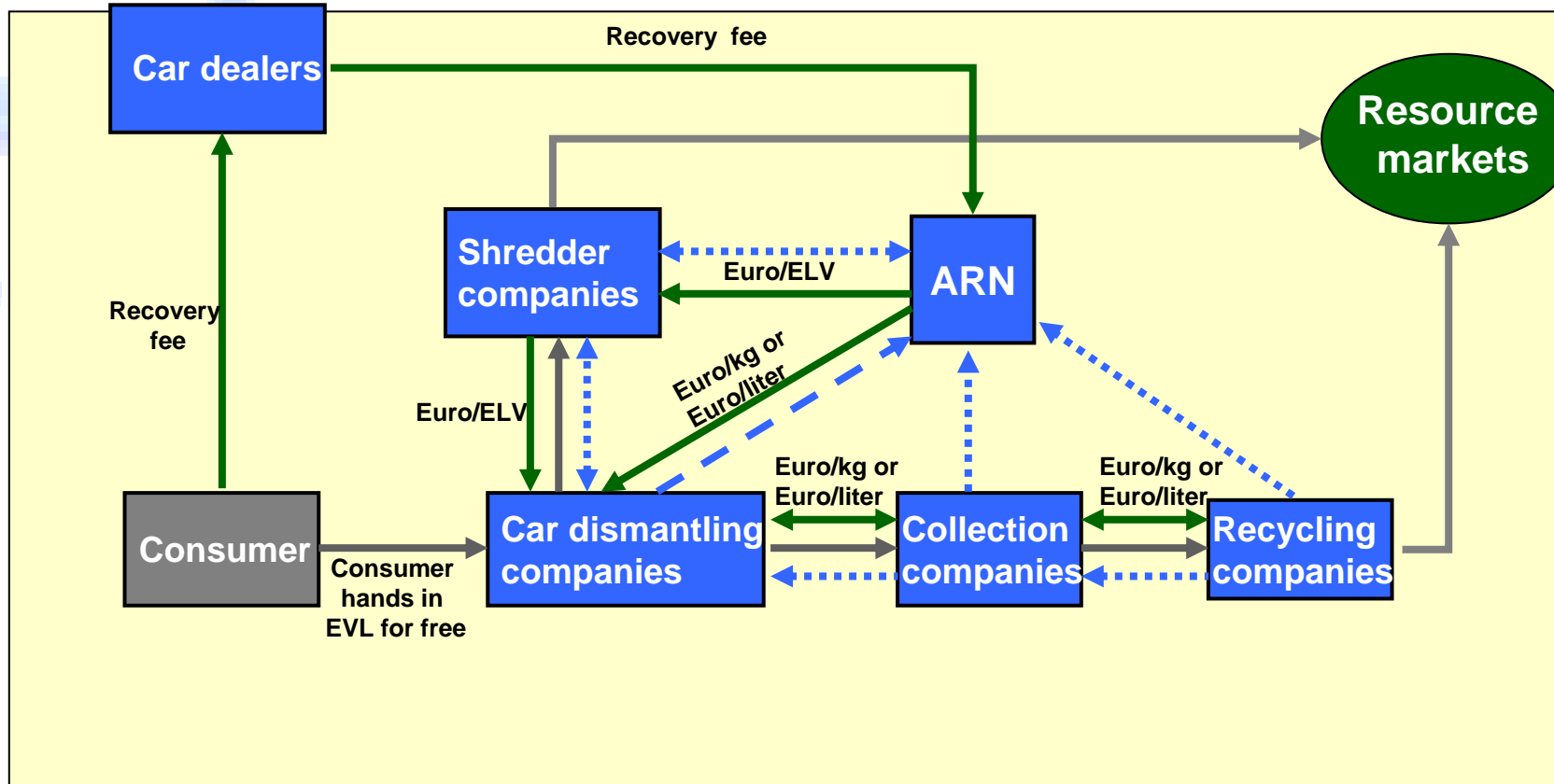
PEOPLE



End-Of-Life Vehicles (EOLV) directive

- **Some of the objectives:**
 - To reduce waste
 - To stimulate design for recovery
 - To reduce hazardous materials
 - To stimulate information sharing
- **7.6 million vehicles recycled, per annum, in the EU-15 (out of 11.3 deregistered cars)**
- **Recovery targets per car:**
 - Currently: **85%** recovery of which max **5%** energy recovery
 - 2015: **95%** recovery of which max **10%** energy recovery

Auto Recycling Nederland (ARN)



- > Physical flow
- > Monetary flow
- ...> Information flow

250.000 cars per year
2.9 million cars since 1995
85% recovery

Impact on sustainability

Profit



- + : Cost-efficient operations (recovery fee from €115 in 1995 to €15 in 2007)
- : Manufacturers are faced with higher cost
- 0 : No negative effect on the competitiveness of European car manufacturers.
- : Limited investments in design for recovery
- : Information is not standardized

Planet



- + : 250 million kilos of waste diverted from landfill in The Netherlands
- : Focus is on recycling (down-cycling), not on reuse or remanufacturing
- : Lack of markets for lower grade recyclates
- : Focus is on the use phase, not on end-of-life
- : Shift from metals to composites?
- : Only about 50% of ELVs are recovered; the rest crosses the border

People



- +/- : # of EOLVs decreases in the Netherlands, and goes up in the Eastern-Europe
 - Shifts in employment
 - Surplus & lack of capacity (geographically-dependent)
 - Eastern-Europe has to handle EOL vehicles without financial compensation

End-of-Life vessel recovery

- 700 vessels recycled per year
- 95% of recovery, mainly in developing countries
- A strong economic incentive: 80% of scrap metal in Bangladesh is met with ship breaking
- Unsafe and environmentally unfriendly practices
- Inter-agency effort to regulate EOL:
 - a resource-passport per ship + dismantling guidelines
 - International Maritime Organization (IMO)
 - Basel Convention on Hazardous Waste Migration
 - International Labor Organization (ILO)
- EU is approaching potential legislation carefully (Rebound effects → e.g. reflagging)

Impact on sustainability

Profit



- +: Inter-agencies effort
- : Lack of economic incentives: Just the stick, what about the carrot?
- : Limited capacity (a peak of single-hulled tanks being decommissioned)
- : Expensive Eco-sites in Europe, while materials demand is in Asia



Planet

- +: More environmentally-friendly practices
- /+ : Existing voluntary guidelines only beneficiary in the long-run



People

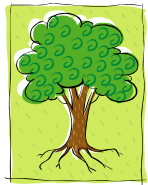
- +: Improved work conditions (health & safety)
- +: Increasing global job market
- +/-: Job market might switch (e.g. from Bangladesh to China)

Aviation EOL: Strengths



-Manufacturer initiatives enable an economically sound implementation

-Limited number of manufacturers.



-High aluminium content enables easy recycling

-Strategic Research Agenda focus on the environment



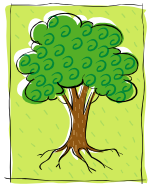
-Relatively clean and safe end-of-life operations

Aviation EOL: Weaknesses



- No clear picture of costs and benefits of end-of-life solutions
- Lack of markets for recyclates

-Feeding recycled materials into production is currently prohibited.



-Recycling of composites is very challenging while their volume is increasing.

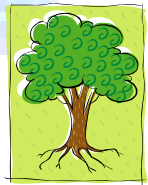
-No incentives for design-for-remanufacturing

-Focus is on life-cycle performance (safety & fuel efficiency), which may form a barrier for investments for end-of-life recovery.

Aviation EOL: Threats



-Volatility of material prices

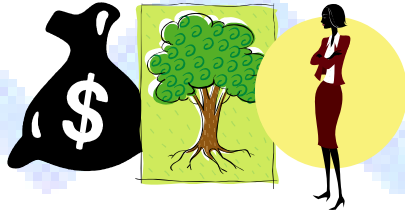


-Transition from aluminium towards carbon fibre use.



-Bootleg parts are a threat both to economics and safety

Aviation EOL: Opportunities



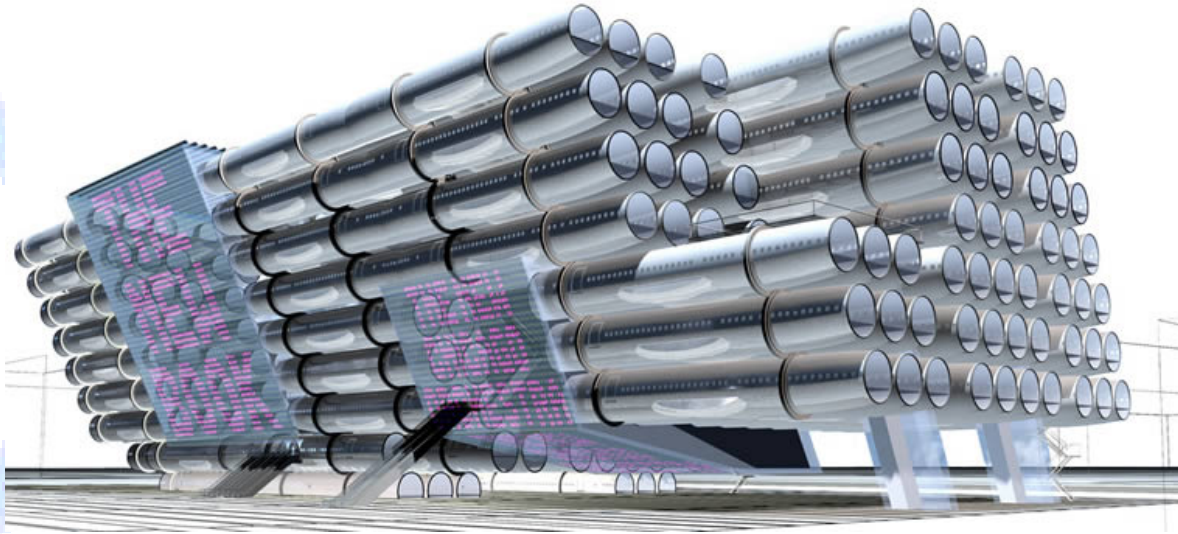
-Experiences from from ELV recovery and shipbreaking can be used to design effective and efficient EOL processes and procedures for the aviation sector

-Design for real closed loop supply chains

Topics for discussion

- What can we learn from the three cases presented (aviation, shipping, automotive) with respect to EPR?
- What role should legislation play in the transition to truly sustainable operations?
- What would be relevant/reasonable policy parameters?

Daring solutions!



Transumo

TRANSition SUsustainable MObility

- This project is made possible with support of Transumo.
- Transumo is a Dutch platform of over 150 companies, governments and knowledge institutes.
- Central aim is to contribute to the transition towards sustainable development.
- Sustainable mobility facilitates economic competition, with ample attention for people and environment.
- The research and knowledge development activities have started in 2005 en will continue until 2009.
- Currently over 20 projects are conducted.
- More information is via www.transumo.nl.