Looking at SDGs
Through a Resource Lens

Upper stream approach
from life cycle perspective

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New-generation vehicle is good for climate change, but needs new materials.

Nickel, Lithium & Misch Metal, etc.

Platinum Group Metals (catalysts)

Materials not used so far are newly and extensively used.

Courtesy of Prof. Eiji Yamasue
TMR: Primary resource for various vehicle

- Conventional: 21 t-TMR
- HV_NiH: 53 t-TMR
- HV_Li: 62 t-TMR
- EV: 74 t-TMR
- FCV: 68 t-TMR

TMR: Total Material Requirement

Courtesy of Prof. Eiji Yamasue
Global sales trend of vehicles

IEA/ETP (Energy Technology Perspective) 2012

Courtesy of Prof. Eiji Yamasue
TMR for the vehicles production

Increase in vehicle number is fourfold.

x 10

TMR for the vehicles production


Steel  Others
Cu  PGM
Plastics  Li
Ni  Al
PGM  Others
Others

Courtesy of Prof. Eiji Yamasue
Potential of TMR reduction by recycling

By using urban resource, TMR can be extremely reduced to 1/5~1/4.

All from primary resource
18.5 kg/kg

All from secondary resource
4.3 kg/kg

Potential TMR reduction by using recycled materials.

Courtesy of Prof. Eiji Yamasue
Inverse Manufacturing: since 1990’s

Resource

Design & production

Products

Materials & parts

Lifecycle loop

Disassembly & reutilization

Energy recovery & waste treatment

Cascade loop

Integration of product design and life cycle flow design

Life Cycle Development

Product Design from LC Perspective
- Application of DfE methodologies (DfR, DfDA, DfRM, DfRU, DfMod, ...)
- Design of multiple products (product architecture, platform, product family)

Life Cycle Flow Design
- Supply chain, production, value chain
- Planning of various LC processes, including maintenance, collection, and recovery system

Product View

External Socio-Techno-Business Factors
- Customer requirements
- Legal requirements
- Company strategy
- Market trend
- (New) technologies
- ...

Process View

Life Cycle Planning
- Product Concept
- LC Strategy
- LC Options
- Business Options

Requirements

Implementation
- Procurement → Manufacturing → Use → EoL

Real World

Courtesy of Prof. Yasushi Umeda
Mainstreaming Sustainable Consumption and Production

Efficiency Policy
- Already mainstreamed

Sufficiency Policy
- Need for mainstreaming

Large differences among regions

Information

Value

Consumption

Disposal

Resource
- Design, Production

Investment Choice

3R Policy
- Recycle, Reuse, Remanufacturing
- Already mainstreamed

Policy Design and Evaluation to Ensure Sustainable Consumption and Production Patterns in Asia Region

Reference: Vergragt, Akenji, Dewick 2014
Upper stream approach from life cycle perspective

• Consider resource efficiency (Goal12) as well as energy efficiency (Goal13)
  • Design and production from life cycle perspective
  • Product life extension by reuse, re-manufacturing
  • Materials recycling

• Collaboration with “Consumption”
  • Collection of used products
  • New business model ex. Sevicizing, Sharing