The need for ‘SUSTAINABLE’ MANAGEMENT of PLASTIC PACKAGING and SUP in the EU

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PLASTICS and the Human Enterprise (as of 1950)

The EU policy approach

An EU Action Plan for the Circular Economy to
- to boost global competitiveness
- foster sustainable economic growth
- generate new jobs
- reduce GHG emissions

Recycling targets for plastics packaging waste (put forth 2018):
- 50 % by 2025
- 55 % by 2030

Development of Plastics & Steel

mill. m³

(annual production in terms of volume)

Polymer production (worldwide 2019)
- ca. 368 mio. t/year
- ca. 4-5 % AAGR (since 1960)

Steel

Plastics

Based on data from PlasticsEurope and International Iron & Steel Institute (IISI)

… the flipside of the success?
The need for ‘SUSTAINABLE’ MANAGEMENT of PLASTIC PACKAGING and SUP in the EU

A topic in context to two superordinate themes:

(1) A meta-level perspective:
The Anthropocene and the UN Agenda 2030 (SDGs)

(2) Transformative Change by Design:
A meaningful (resilient and smooth) transition to a ‘sustainable’ all-circular plastics & carbon economy
[perspectives for Austria & the EU?]

Summary & Outlook (The Policy Dimension)
**FRESH IMPULSES by Industry**

**Press conference** (Sept. 03, 2021)

Alfred Stern
CEO of OMV (since Sept. 01, 2021)

"Transformative Change is unavoidable" („Der Wandel ist unausweichlich“):

"The TRANSFORMATION must be fast, profound and in parts accelerating."

- The **NEW PILLARS** of OMV:
  - Circular Economy, Sustainability and the Paris Climate Goals
- Priority order for **FUTURE STRATEGY**:
  - "Planet, People, Profit"

New OMV Strategy 2030
(March 15, 2022)

- **OMV aims** to become a leading, integrated sustainable fuels and materials company with a strong focus on circular economy solutions
- **Net-zero** (Scope 1, 2 and 3) to be reached by **no later than 2050**.

The UN-SDG perspective:
- Planet | People/Prosperity | (Profit)

HUMANITY as a whole is facing an increasing number of so-called GRAND CHALLENGES which are highly interlinked & interdependent, causing multiple and evermore severe CRISIS SITUATIONS, threatening the survival of organized human societies.
The International Geosphere-Biosphere Programme (IGBP) inspired in 2000 by P. Crutzen (Vice Chair of IGBP)

**GREAT ACCELERATION** charts:
- 12 socio-economic
- 12 earth system indicators

Many of the trends are closely **interlinked & interdependent!**

Reference:

Map & Design: Félix Pharand-Deschénes/Globaïa

www.futureearth.org
DYNAMICS OF THE HUMAN ENTERPRISE (2/3)

... The ANTHROPOCENE

The International Geosphere-Biosphere Programme (IGBP) hosted by the Royal Swedish Academy of Sciences inspired in 2000 by P. Crutzen (Vice Chair of IGBP)

**Great Acceleration** charts:
- 12 socio-economic
- 12 earth system indicators

Many of the trends are closely interlinked & interdependent!


Reference:
www.futureearth.org
DYNAMICS OF THE HUMAN ENTERPRISE (3/3)

... Surpassing of Planetary Ecological Limits?

The Ecological Compass
indicating the operating ranges
of human activity (9 AREAS)

2022: Pollutants, including PLASTICS, exceeded!

Planetary boundaries according to Rockström et al. (2009), Steffen et al. (2015/2019) and Persson et al. (2022):

- Beyond zone of uncertainty (high risk)
- In zone of uncertainty (increasing risk)
- Below boundary (safe)
- Boundary not yet quantified


THE EQUITY ISSUE:
~20 % rich cause ~70% of the problems!
SUSTAINABLE DEVELOPMENT
UN AGENDA 2030 | SUSTAINABLE DEVELOPMENT GOALS (SDGs)

FROM MDGS 2015 TO SDGS 2030

The SDGs 2030:
- 17 goals
- 169 targets
with indicators & monitoring scheme!

ENERGY pervades all & dominates several SDGs & indicators!

www.un.org/sustainabledevelopment/
OUTLINE: 2 TOPICS | 3 KEY MESSAGES

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Summary & Outlook (The Policy Dimension)
CIRCULARITY GAP Reports by Circle Economy

HALF A TRILLION TONNES OF VIRGIN MATERIALS, OUR WORLD IS ONLY 8.6% CIRCULAR.

5 GLOBAL REPORTS (2018 – 2022)

3 NATIONAL REPORTS:
- Austria (9.7% in 2019)
- Norway
- The Netherlands

WORLDWIDE:

FACTOR >200 between CO₂ EMISSIONS (non-visible) vs. PLASTICS WASTE (visible)

https://www.circularity-gap.world/2022
PLASTICS Circular Economy | CLOSING THE LOOP
The Plastic Bag Ban (enacted in Austria as of 01/2020)

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**Amount of Waste (AT)**

<table>
<thead>
<tr>
<th></th>
<th>in t (per year)</th>
<th>in %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Waste Streams</strong></td>
<td>~ 424,000,000</td>
<td>100 %</td>
</tr>
<tr>
<td><strong>Share CO₂</strong></td>
<td>~ 80,000,000</td>
<td>20 %</td>
</tr>
<tr>
<td><strong>Share PLASTICS TOTAL</strong></td>
<td>~ 920,000</td>
<td>0.2 %</td>
</tr>
<tr>
<td><strong>Share PLASTICS BAGS</strong></td>
<td>~ 7,000</td>
<td>0.002 %</td>
</tr>
</tbody>
</table>


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**For the CLIMATE, this is WORTHLESS!**

"The plastic bag issue is a never-ending story, which leads us on side tracks and keeps us from addressing the real important issues."

R. W. Lang
PLASTICS Circular Economy | CLOSING THE LOOP
Towards all-circular process pathways (data below for Austria)
PLASTICS Recovery Options & Performance

Principle pathways of product/material recovery

- **product reuse** (repair, repurpose, etc.)
- **mechanical recycling** (materials recycling)
- **chemical recycling** (feedstock recycling)
- **energy recovery** coupled with CO₂ utilization (CCU, feedstock recycling)

The widening **performance gap**: Mechanical recyclates vs. next generation “virgin” materials

The widening performance gap:
Mechanical recyclates vs. next generation “virgin” materials

Service relevant material performance evolution

- **“down-cycling”**
  cascadic performance deterioration

- **“up-cycling”**
  innovation-driven performance enhancements

R. W. Lang, University of Linz (A), October 2015
Some key findings (a selection):

- Resource/energy/GHG efficiency can be high (best) even at low ‘mechanical’ recycling rates
- Compared to other materials, the material/energy/GHG reduction realized by plastics packaging is often several times higher than the remaining optimization potential for higher plastics recycling
- For plastics waste, NO general waste management hierarchy for recovery options can be derived from environmental benefits
- Eco-efficient (sustainable) recovery of post-use plastics requires a product specific life cycle (LC)/cost benefit (CB) analysis
- Rough estimation of maximum eco-efficient, mechanical plastic packaging recycling (incl. domestic and commercial):
  - INPUT based: 35 – 53 %
  - OUTPUT based: 31 – 43 %

Source: “Criteria for eco-efficient (sustainable) plastic recycling and waste management“ Fact based findings from 20 years of denkstatt studies denkstatt GmbH, 2014

Source: R. W. Lang, University of Linz (A), October 2015
Not every **CIRCULAR ECONOMY** path is per se ‘**SUSTAINABLE**’!

A product/application specific **SYSTEMS PERSPECTIVE** incl. a comprehensive/full **LC/CB (PEF) ANALYSIS** guided approach is required to determine meaningful (sustainable!) recycling targets!

**Product Life Cycle Analysis (LCA/PEF)** must become an **indispensable tool** for all **product development** and **marketing**!
Any ‘SUSTAINABLE’ CIRCULAR ECONOMY path for PLASTICS must account for and reflect the ongoing ENERGY TRANSITION to renewable energies!

The ENERGY TRANSITION together with new options for a Circular Carbon Management (CCM/CCU; chemical/feedstock recycling, CO₂ utilization) may be a game changer for the CIRCULAR ECONOMY of PLASTICS.
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Summary & Outlook (The Policy Dimension)
SUMMARY & OUTLOOK (1/2)

#forumFUTURE proposes a …
‘NEW INDUSTRIAL DEAL‘ for AUSTRIA & EUROPE

Energy- & Climate Politics and Circular Economy are economic, environmental and resource political TOP PRIORITIES of the EUROPEAN UNION!

ReTHINKING ENERGY- & MATERIAL Economics:
A CROSS-SECTORAL Energy, Climate & Circular Economy Strategy
KEY ITEMS & FEATURES:

▪ **INNOVATION** to secure AUSTRIA’S industry: energy efficiency, renewable energy technologies, **circular carbon-management** *(systems integration)*

▪ **Cross-industrial SECTOR-COUPLING:** All-sector integrated energy, climate and circular economy strategy *(energy & materials economy)*

▪ **Industrial FLAGSHIP-CLUSTER Initiatives**
  Cross-sectorial Flagship-Cluster Projects for the emission-intensive industry *(Steel, Chemicals/Plastics, Cement, Waste Management)*

▪ **FUNDING & INCENTIVE mechanisms**
  Use of existing and development/implementation of novel national and European funding initiatives *(IPCEI, Recovery & Resilience Facility, EU Innovation Fund, etc.)*
A GREEN DEAL FOR AUSTRIA’S INDUSTRY
GOVERNMENTAL PROGRAM 2020 – 2024 | Cross-sectoral Flagship Initiatives

Potential cross-sectoral FLAGSHIP-CLUSTER INITIATIVES:

▪ "STEEL & PLASTICS"
  e.g. voestalpine, Borealis, VERBUND, RAG, N.N.

▪ "CEMENT & PLASTICS"
  e.g. Lafarge, Borealis, OMV, VERBUND, N.N.

▪ "WASTE MANAGEMENT"
  e.g. Wien Energie, ARA, Saubermacher, Borealis, N.N.

▪ "GREEN ENERGY INFRASTRUCTURE"
  e.g. OMV, VERBUND, RAG, N.N.

 MEDIA & PRESS RELEASE: 24 JUNE 2020
 MoU: LAFARGE/OMV/VERBUND/BOREALIS
 “Carbon2ProductAustria“ [short: C2PAT]

AUGUST 2021
C2PAT GmbH

CROSS SECTORAL VALUE CHAIN

to drive climate neutrality

Source: C2PAT consortium

Aim 2030:
▪ 700,000 t of CO₂ sequestration in Austria
▪ demonstration of global scalability!
Huge amounts of renewable energy needed

A ‘New Green Deal‘ for Africa & Europe/Austria (1/2)

**Mobilizing “Carbon Circularity“?!**

From **Carbon dioxide**

to

**Methane & Methanol**

to

**PLASTICS**

in a circle – HOW?

\[
\text{CO}_2 + \text{H}_2\text{O} \xrightarrow{+ \text{rEn}} \text{CH}_4, \text{CH}_3\text{OH} \xrightarrow{+ \text{rEn}} \text{“PLASTICS“} (C_xH_y \text{ etc.})
\]

New Green Deal

AFRICA-EUROPA

in partnership &
at eye-level!
HUGE AMOUNTS OF RENEWABLE ENERGY NEEDED

A ‘NEW GREEN DEAL’ for Africa & Europe/Austria (2/2)

Desertec 3.0
‘Emission Free Energy for MENA and the World’
Club of Rome Austria, 15.9.2021
Paul Van Son, President Dii Desert Energy

NEW GREEN DEAL AFRICA-EUROPE
in partnership at eye-level!

Export: Existing and new Gas Infrastructure
Eventually to be used for hydrogen

- Natural gas infrastructure Europe - North Africa (left figure) and first outline for a hydrogen backbone infrastructure Europe-North Africa (figure above)
- An existing gas infrastructure from Algeria and Morocco could be converted to a hydrogen infrastructure (grey-orange lines).
- A “new” hydrogen transport pipeline must be realized from Italy to Greece, crossing the Mediterranean Sea to Egypt, which could eventually be extended to the Middle East (orange line).
KEY MESSAGE 3: A CATEGORICAL STATEMENT
Why an Industrial Carbon Circularity is essential?

Without industrial CARBON (CO₂) CIRCULARITY, No CIRCULAR ECONOMY and No SUSTAINABLE DEVELOPMENT !!!

Recommended change in terminology: From DECARBONIZATION to DEFOSILIZATION and sustainable, circular CARBON MANAGEMENT!

Note: INCINERATION of PLASTICS coupled with thermal energy use and CCU driven by renewable energy needs to be acknowledged as ‘recycling’ in terms of a valid Circular Economy option at EU policy levels!
SUMMARY & OUTLOOK (2/2)

Where are we coming from? | Where are we headed? | What are we aiming for?

Navigating the **NEXT GREAT (INDUSTRIAL) TRANSFORMATION?**

From a **FOSSIL-FUEL ENERGY** driven, linear & resource depleting prosperity model **for a few** …

… to a **RENEWABLE (SOLAR) ENERGY** driven, circular & regenerative resource prosperity model **for all**!

Key question (as to the current State-of-the-World):

**ARE WE (HUMANS) LEARNING FAST ENOUGH** (individually & collectively)?

Leave no one behind!