THE CONCEPT OF CIRCULAR ECONOMY APPLIED TO CCS, WASTE AND WASTEWATER TREATMENT TECHNOLOGIES

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CIRCULAR ECONOMY

- Actual topic worldwide
- Linear economy
  - Take → Make → Use → Dispose
- Circular economy
  - Reuse → Remake → Recycle
- Reasons:
  - Economic
  - Environmental
  - Safety
## ENVIRONMENTAL ASPECTS

<table>
<thead>
<tr>
<th>What is needed for implementing a circular economy</th>
<th>Obstacles in implementing a circular economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show the public that environmental issues are not restricted to scientists and environmentalists, but also include designers, economists, and other specializations.</td>
<td>Lack of knowledge of the environmental context of one’s own activities.</td>
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<tr>
<td>Interconnecting all stages of lifecycles.</td>
<td>Poor understanding of a circular economy as a tool for solving waste problems (too narrow a focus of the solution).</td>
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<tr>
<td>Develop effective, but also cost-effective recycling technologies.</td>
<td>Narrow focus solely on recycling.</td>
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</table>
## SOCIAL ASPECTS

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<tbody>
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<td>Education of society in the area of environmental and technical sciences.</td>
<td>Narrow specialization.</td>
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<tr>
<td>Stable democratic system of government with a long-term vision.</td>
<td>Short responsibility of political leadership of the state, state of war.</td>
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<tr>
<td>Communication between consumers and producers - Unification of the environmental labeling of products, eco-labelling.</td>
<td>Distrust of general public, greenwashing.</td>
</tr>
</tbody>
</table>
## ECONOMIC ASPECTS

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<td>Circular economy must pay off economically.</td>
<td>Failure to incorporate externalities into the economy.</td>
</tr>
<tr>
<td>Circular economy must ensure availability of key raw materials.</td>
<td>High price of recycled materials.</td>
</tr>
<tr>
<td>Increasing the share of labor in the resulting product.</td>
<td>Too high cost of labor in comparison with the cost of materials and raw materials.</td>
</tr>
<tr>
<td>Examples of good practice – success stories.</td>
<td>Negative experiences with subsidies in certain sectors of industry or technology.</td>
</tr>
<tr>
<td>New business systems based on sharing and leasing.</td>
<td></td>
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</table>
## PRACTICAL ASPECTS

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<td>Unification of nomenclature and legislation.</td>
<td>Barriers in international trade and movement of materials across borders.</td>
</tr>
<tr>
<td>Promote &quot;soft&quot; instruments for deployment of circular economy instead of directive targets.</td>
<td>Directive targets lead to pragmatic solutions and reduce the dynamics of the whole implementation process of a circular economy.</td>
</tr>
</tbody>
</table>
Carbon Capture and Storage (CCS) technologies aim to reduce CO\textsubscript{2} emissions from the burning of fossil fuels, thereby reducing the unwanted greenhouse effect.

- Energy to achieve the goal is sometimes high
- Result is captured CO\textsubscript{2}, not a final solution of the problem
WASTE TREATMENT TECHNOLOGIES

- Incinerators are designed to certain energy content of waste materials
- Lower energy content of wastes decreases effectivity of waste incineration – worst atmospheric emissions
DECONTAMINATION TECHNOLOGIES

- Energy and material inputs needed for decontamination technologies are sometimes very high.
- Emissions associated with decontamination operations could be higher than the benefits of result.
HAZARDOUS WASTES

- Incineration of hazardous waste could not be efficient enough.
- Cement plant can destroy hazardous wastes more efficiently.
- Final product – cement – unfortunately contain problematic substances – sludges from concrete production are being problematic.
RECYCLATION – CONSTRUCTION WASTES

- Demolition wastes containing concrete are an example of a material flow which has a high volume and mass within the waste management sector.
- This results in saving the primary raw material - natural stone.
- Currently, the disadvantage of this procedure is its low economic profitability.
- In many cases primary aggregates are available on the market at very low prices.
- Therefore, recycled aggregates are not economically interesting – yet.
WASTEWATER TREATMENT TECHNOLOGIES IN CIRCULAR ECONOMY

• Energy efficient
• Nutrient - especially phosphorus - recovery.
• The composition of municipal wastewater is different from one region to another, but the main components that have to be technologically removed are biodegradable substances.
• These substances contain biologically available nitrogen and phosphorus – the main nutrients used in agricultural fertilizers.
WASTEWATER TREATMENT TECHNOLOGIES

• Cleaning of municipal wastewater is considered, for municipalities, an economic burden.

• The proper treatment of municipal wastewater requires both energy and material inputs.

• The profit obtained from energy recovery of the sludge can be quite significant.

• However, in many cases, the overall energy balance of a wastewater treatment plant is negative - it is necessary to provide energy.
CONCLUSION

• The circular economy approach applied to contemporary management represents the use of materials and energy in a renewable way.

• Outputs that would normally be considered waste are now inputs for another process.

• Circular economy is not going to replace waste management with recycling.

• The development of new recycling technologies without taking into consideration the products’ design, their production line and use, will not lead to significant benefits in terms of savings of raw materials and energy.
FINAL REMARK

• Besides taking into account these externalities, it is necessary for the development of circular economy to change the requirement of continuous economic growth.

• The current economic model is expecting alternating periods of economic stagnation followed by a period of economic growth.

• However, the fluctuation occurs and constantly improves the performance of the economy.

• The current global economic model will inevitable lead to the viable concept of circular economy, as long as the performance of the economy is based on material and energy consumption.
THANK YOU
FOR YOUR ATTENTION

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