Business-models of gravel, cement and concrete producers in Switzerland and their relevance for resource management and economic development on a regional scale

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High construction activity and limited resources call for circular economy!
Research Questions (general)

“Co-Evolution of Business Strategies in Material and Construction Industries and Public Policies”

Research project funded by the Swiss National Science Foundations (2017-2021).

Guiding research questions:

• What are the central co-evolution mechanisms driving alternative business models and regulation in the Swiss construction industry?
• How can this co-evolution process be directed towards sustainability?
“Co-Evolution of Business Strategies in Material and Construction Industries and Public Policies”

Ronny Meglin
SBE 19, Graz
12.09.2019
Research Questions

- Can the success of alternative business models be explained by boundary conditions in the specific markets, in the regional supply of natural resources or incentives from public administration?

- If a business model is considered favorable in the transition towards a circular economy, can it be transferred from one region to another without losing its economic benefits?

- How does such a transition towards alternative business models affect regional resource consumption, emissions and value added on regional scale?
How to assess an industry?

Environmental Extended Input-Output-Tables
- environmental impact: global warming potential GWP 100 years, kg CO$_2$ eq
- economic impact: value added VA in CHF/a

Material-Flow-Analysis (MFA)
(data from existing models; case studies)

Life-Cycle-Assessment (LCA)
for concrete (ecoinvent database)

Prices and costs
(case studies, statistical data)
## Which Indicators?

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of virgin gravel/sand extracted</td>
<td>ton per year</td>
</tr>
<tr>
<td>Amount of excavated material deposited</td>
<td></td>
</tr>
<tr>
<td>Amount of recycling materials used for producing construction materials</td>
<td></td>
</tr>
<tr>
<td>Value added</td>
<td>CHF per year</td>
</tr>
<tr>
<td>Global Warming Potential (GWP)</td>
<td>kg CO$_2$ eq. per year</td>
</tr>
</tbody>
</table>
MFA of Companies

Company A
"Extraction"

Company B
"Recycling"
## Results Companies

<table>
<thead>
<tr>
<th></th>
<th>Change in Value added per ton of concrete</th>
<th>Change in Value added per ton of primary aggregate</th>
<th>Change in Value added per ton of recycling aggregate</th>
<th>Change in GWP per ton of concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[CHF] company A company B</td>
<td>company A company B</td>
<td>company A company B</td>
<td>company A company B</td>
</tr>
<tr>
<td>landfill</td>
<td>3.38 -</td>
<td>5.67 -</td>
<td>-1.30 -</td>
<td>- -</td>
</tr>
<tr>
<td>gravel extraction</td>
<td>7.34 4.83</td>
<td>11.50 6.54</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>production primary aggregates</td>
<td>1.58 7.10</td>
<td>2.47 12.19</td>
<td>- -</td>
<td>3.13 2.82</td>
</tr>
<tr>
<td>production recycling aggregates</td>
<td>2.81 2.60</td>
<td>- -</td>
<td>15.49 14.63</td>
<td>0.69 0.66</td>
</tr>
<tr>
<td>concrete production</td>
<td>19.50 21.60</td>
<td>- -</td>
<td>- -</td>
<td>99.22 99.22</td>
</tr>
<tr>
<td></td>
<td>34.61 36.13</td>
<td>19.64 18.73</td>
<td>14.18 14.63</td>
<td>103.04 102.71</td>
</tr>
</tbody>
</table>
MFA of Model Region «AlpVal»

- Stockchanges [t]
- Flows [t/a]
- gravel sand
- production primary aggregates
- gravel
- concrete
- RC aggregates (high quality)
- cement
- excavation
- sorting excavated material
- other products
- construction waste to landfill
- building stock and terrain

- excavation material with high gravel content
- excavation material to landfill
- production RC aggregates
- gravel for concrete
- gravel pits/Landfill
- RC aggregates (low quality)
- cement
- production primary aggregates
- concrete production
- construction waste to landfill
- 380,400
- 245,600
- 208,000
- 696,000
- 649,000
- 25,600
- 23,000
- -339,600
- 720,000
- 556,000
### Results Regions

**Scenario A**: All concrete and gravel produced in ALPVAL is produced by company A “Extraction”  
**Scenario B**: All concrete and gravel produced in ALPVAL is produced by company B “Recycling”

<table>
<thead>
<tr>
<th></th>
<th>Status Quo</th>
<th>Scenario A</th>
<th>Scenario B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of virgin gravel/sand extracted (tons per year)</td>
<td>720'000.00</td>
<td>656'432.00</td>
<td>402'944.00</td>
</tr>
<tr>
<td>Amount of excavated material deposited (tons per year)</td>
<td>380'400.00</td>
<td>485'264.00</td>
<td>0</td>
</tr>
<tr>
<td>Amount of recycling materials used for producing construction materials (tons per year)</td>
<td>208'000.00</td>
<td>253'280.00</td>
<td>253'280.00</td>
</tr>
<tr>
<td>Value added (CHF per year)</td>
<td>33'948'144.00</td>
<td>34'690'928.00</td>
<td></td>
</tr>
<tr>
<td>Global Warming potential (kg CO2 eq per year)</td>
<td>71'715'840.00</td>
<td>71'486'160.00</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

- success of both BM depends on the regional availability of raw materials and the possibility to process/landfill excavated material, but both BMs are economically beneficial ► depends on settlement development / spatial planning

- higher material turnover leads to a higher revenue ► BM so far do not fully decouple this logic but expand their value proposition with additional services such as waste management and logistics.

- effects on resource consumption (virgin material and amount of excavated material deposited) can be significant

- it is essential to identify alternative business models and understand their impact on the production and consumption of primary and secondary resources
THANK YOU FOR YOUR ATTENTION

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