CIECH Soda Romania

A player on the European soda market and contributor to the economy of Romania and Vâlcea County

11 September 2019
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Executive summary

01

CIECH Soda Romania (CSR) is a manufacturing company located in the Vâlcea region in Romania. For 60 years it has carried out its soda manufacturing operations and now supplies the Romanian market as the only domestic producer. CSR exports its soda products to over 70 countries.

02

Rooted deeply in the region, CSR supplies local value chains including glass bottle and window manufacturers, sourcing inputs from Romanian Treasury-owned companies. The factory is also the fifth largest private employer in the region with over 600 full-time employees.

03

CIECH Group is the majority shareholder of CSR. CIECH Group is an international chemistry holding with a presence in over 100 countries and 2018 revenue equal to nearly USD 1.0 billion. In 2014 the majority of CIECH’s stock was acquired by KI Chemistry, a company belonging to the largest Polish private investment firm, Kulczyk Investments.

04

The acquisition of CIECH by KI Holding resulted in substantial reorganization of CSR. An injection of funding of EUR 140 million into the business removed the liabilities and allowed for asset modernization. New strategy and business organization followed to further enhance operations.

05

Owing to the transformation, the revenues of CSR increased by 50% over the 2014-18 period to reach a net value of RON 443.7 million.

06

Production volume growth over the last 5 years has been substantial. In 2017 the Company produced an all-time-high 540,000 tonnes of soda products - a 30% increase over 2014 figures. With stable domestic sales, CSR has greatly increased its international market with a more than 30% increase in countries served and improving its position in direct sales by over 80%, recapturing volumes sold previously by third party dealers.

07

There are four critical cost drivers for the CSR operations: steam, electricity, limestone and brine. Steam, limestone and brine are sourced from exclusive suppliers with no immediate replacements apparent (or possible).

08

The steam supplier, CET Govora, suffered a serious damage due to accident in the first half of 2019 thus limiting the supply of steam by a substantial margin. Starting from 18 September 2019, proposed prices of steam will rise sharply by 135% compared with the 2018 level.

09

The proposed prices of steam deeply impact CSR operations as steam constitutes over 40% of the Company's total costs, making production non-economical.

10

CSR has announced to cease operations at the plant starting from 18th September 2019, while negotiating steam prices with the supplier.

11

As CSR is a major company in the Romanian Vâlcea Region, it is anticipated that potential discontinuance of its business operations will have substantial economic and social consequences.

12

The impact of the operational activity of the CIECH Group on the economy of Romania and Vâlcea county in 2018, taking into account the links of the CIECH Group to the rest of the Romanian economy, was as follows:

- RON 445 m of value added (~GDP) was generated in Romania, of which RON 260 m was generated in Vâlcea county
- RON 1.3 bn of global output (~revenues) was generated in Romania of which RON 869 million was generated in Vâlcea county
- More than 4,400 jobs were created in Romania of which more than 2,160 jobs were created in Vâlcea county
- RON 98 million of government revenues were generated in Romania of which RON 4.5 million were received by local government units in Vâlcea county.
Economic impact summary

**COUNTRY LEVEL**

RON 445 mn  
(EUR 96 mn)  
of value added (~GDP) generated in Romania

- Ron 1 mn generated directly by the CIECH Group
- Ron 3.3 mn in the rest of the economy

RON 1.3 bn  
(EUR 279 mn)  
of global output (~revenues) generated in Romania

ca. 4,400 jobs created in Romania

- 1 job created directly by the CIECH Group
- 5.9 jobs in the rest of the economy

RON 98 mn  
(EUR 21 mn)  
of government revenues generated in Romania

- RON 1 mn generated directly by the CIECH Group
- RON 3.1 mn in the rest of the economy

**VÂLCEA COUNTY LEVEL**

RON 260 mn  
(EUR 56 mn)  
of value added generated in the Vâlcea county

RON 869 mn  
(EUR 187 mn)  
of global output generated in the Vâlcea county

ca. 2,160 jobs created in the Vâlcea county

- 1 job created directly by the CIECH Group
- 5.9 jobs in the rest of the economy

RON 4.5 mn  
(EUR 967 thous.)  
of government revenues received by the local government units in the Vâlcea county

- RON 1 mn generated directly by the CIECH Group
- RON 3.1 mn in the rest of the economy
In this chapter we present a general business overview of CIECH Soda Romania and the competitive environment in which it operates.

CIECH Soda Romania is the only Romanian soda producer

- 60 years of continuous operations
- more than 600 employees (2018)
- part of the 2nd largest soda company in EU
- Top 5 privately owned company in the Vâlcea region in terms of revenue and employment (2nd largest by revenue)
CIECH Soda Romania (CSR) is a major company in the Vâlcea region and part of the international CIECH Group

OVERVIEW OF CIECH SODA ROMANIA

CIECH Soda Romania (CSR), formerly known as Uzinele Sodice Govora, is located in the southern part of Romania, in the town of Rumnicu Vâlcea. CSR is the sole soda producer on the economic map of Romania and one of the most important factories in the country. As a strategic supplier to glass and detergent producers, CSR plays an important role in establishment of robust industrial supply chains in Romania.

The Romanian soda factory was the first foreign company acquired by the international CIECH Group (in December 2006).

COMPANY INFORMATION (2018)

<table>
<thead>
<tr>
<th>Thousand</th>
<th>RON</th>
<th>USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total operating revenue</td>
<td>443,700</td>
<td>112,614</td>
</tr>
</tbody>
</table>

Production of soda is a commodity industry focused on cost base. The key cost drivers are:

- **Steam**: Contribution to cost of goods sold (COGS) ~70%
- **Electricity**: ~35%
- **Limestone**: ~9%
- **Brine**: ~16%
- **Steam, limestone and brine** are sourced by CSR via a single and exclusive supplier.

KEY OUTPUTS

The key products of CIECH Soda Romania are:

- **Soda ash**
- **Sodium silicates**
- **Water glass**
- **Soda derivatives**
- **Dense soda ash with application in the glass industry, which is the flagship product.**

VALUE CHAIN PRESENCE

Local glass and detergents companies are the key local customers for CSR products. Internationally CSR serves a large base of international clients with more than 140 customers in more than 70 countries in Europe, Africa, North and South America as well as Asia. A detailed analysis of the soda value chain is presented on pages 46-47.

Source: CSR financial statements and data

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CSR as a unique soda production facility in Romania

Being part of the larger CIECH Group, CSR vastly benefits from the ownership

CIECH IS AN INTERNATIONAL COMPANY WITH DIVERSIFIED PRODUCT PORTFOLIO

- **2nd**
  - The second largest producer of soda ash in Europe
- **1st**
  - The largest producer of evaporated salt in Poland (55% of market share)
- **8**
  - Production facilities in Europe (6 in Poland, 1 in Germany, 1 in Romania)
- **4**
  - Operating segments incl. soda, glass and silicates as well as organics
- **100**
  - CIECH Group products are sold to 100 countries worldwide
- **3.9k**
  - There are a total of 3,871 FTEs in the CIECH Group

CIECH GROUP SODA BUSINESS VALUE CHAINS

**INPUT**

- **Materials (Synthetic Production Method)**
  - Steam
  - Electricity
  - Limestone
  - Brine

**OUTPUT**

- **Soda products**
  - Soda ash
  - Sodium bicarbonate
  - Calcium chloride
  - Evaporated salt

**APPLICATIONS**

- Panes, packaging glass, flat glass
- Cleaning agents, disinfectants
- Flux, smelting agents
- Reagents, depressants, flue gas absorbers
- Food additives

CIECH GROUP PRESENCE HAS A SUBSTANTIAL IMPACT ON CSR COMPETITIVENESS

Total investment in the company in the last 5 years amounts to EUR 140 million or an approximate 120% of annual revenue. The fund injection both cleared the liabilities and allowed the company to modernize the production facilities to almost double the capacity from 2009 volumes.

The modernization of the plant was followed with new management principles resulting in redefinition of go-to-market strategy, creation of a reshaped business model and restructuring of the sales team that already ships the product to 72 countries around the globe.

By being a part of the larger CIECH group CSR has gained more reliable facility output. Its production output has grown by double digit numbers. This can be attributed to the shift in perception of CSR in the market and ability to diversify the sales portfolio.
With a performance history of 60 years, Govora is a well established, continuously growing plant

Since 2014 CSR has achieved significant improvements in major KPIs

**KEY INDICATORS**

<table>
<thead>
<tr>
<th>2018</th>
<th>CHANGE FROM '14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual capacity</td>
<td>540,000 tonnes</td>
</tr>
<tr>
<td>Sales revenues</td>
<td>RON 443.7 million</td>
</tr>
<tr>
<td>Long-term liabilities</td>
<td>RON 4.1 million</td>
</tr>
<tr>
<td>Current liabilities</td>
<td>RON 63.1 million</td>
</tr>
<tr>
<td>CAPEX</td>
<td>RON 150.0 million</td>
</tr>
</tbody>
</table>

**OWNER**

<table>
<thead>
<tr>
<th>EVENT</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1959</strong></td>
<td>The Company is founded as Uzinele Sodice Govora</td>
</tr>
<tr>
<td><strong>1959-2006</strong></td>
<td>The Company is owned by the Romanian state</td>
</tr>
<tr>
<td><strong>2006</strong></td>
<td>CIECH Group purchases the Company</td>
</tr>
<tr>
<td><strong>2006-2014</strong></td>
<td>Over EUR 140 million invested in the Company</td>
</tr>
<tr>
<td><strong>2014</strong></td>
<td>KI Chemistry acquires the controlling stake in the CIECH Group</td>
</tr>
<tr>
<td><strong>2014-2016</strong></td>
<td>Restructuring process under new investor’s strategy</td>
</tr>
<tr>
<td><strong>2015</strong></td>
<td>Production capacity exceeds 540 KTA</td>
</tr>
<tr>
<td><strong>2018</strong></td>
<td>Company sells over 80% of production overseas</td>
</tr>
<tr>
<td><strong>2019</strong></td>
<td>Unsustainable steam supply and price puts CSR at risk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OWNER</th>
<th>EVENT</th>
<th>IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Romanian State Treasury, then private Romanian investors</td>
<td><strong>1959</strong></td>
<td>The Company is founded as Uzinele Sodice Govora</td>
</tr>
<tr>
<td>CIECH S.A. (Polish State Treasury holding)</td>
<td><strong>1959-2006</strong></td>
<td>The Company is owned by the Romanian state</td>
</tr>
<tr>
<td>CIECH S.A. (Kulczyk Investments as a strategic investor)</td>
<td><strong>2006</strong></td>
<td>CIECH Group purchases the Company</td>
</tr>
<tr>
<td></td>
<td><strong>2006-2014</strong></td>
<td>Over EUR 140 million invested in the Company</td>
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<td>Restructuring process under new investor’s strategy</td>
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<tr>
<td></td>
<td><strong>2015</strong></td>
<td>Production capacity exceeds 540 KTA</td>
</tr>
<tr>
<td></td>
<td><strong>2018</strong></td>
<td>Company sells over 80% of production overseas</td>
</tr>
<tr>
<td></td>
<td><strong>2019</strong></td>
<td>Unsustainable steam supply and price puts CSR at risk</td>
</tr>
</tbody>
</table>

Owing to profound modernization of the plant, CSR was able to increase production capacity by 30% from 2014 to 2018, reaching the amount of 540,000 tonnes per annum.

Net sales revenues increased substantially between 2014 and 2018, with a CAGR approximate of near 10% and cumulative increase of 50% in total.

While in 2014 CSR’s long-term liabilities exceeded RON 480 million, the long-term debt towards CIECH Group has been paid after equity increase done by CIECH. In result long term liabilities declined to the marginal level of RON 4.0 million as per 2018.

Over the last five years CSR has significantly improved its management of current liabilities, reducing them by 75%.

From 2014 to 2018 CSR invested nearly RON 150 million in plant optimization, modernization and replacements as well as building consolidation and other investments such as IT.
CSR’s plant is one of a few soda ash production facilities in Europe

SODA ASH PRODUCTION PLANTS IN EUROPE (2018)

Facilities:
- Solvay (BE)
- Tata Chemicals (UK)
- CIECH (PL)
- Sisecam (TR)

Soda ash top three producers in Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Capacity (KTA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvay</td>
<td>5.0</td>
</tr>
<tr>
<td>Ciech</td>
<td>2.6</td>
</tr>
<tr>
<td>Sisecam</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Source: EY Analysis based on companies’ reports

DOING SODA BUSINESS IN ROMANIA AND THE BALKANS REGION

CIECH Soda Romania is the only producer of soda ash located in Romania. With capacity reaching 540,000 tonnes per annum, it serves local customers from various industries, including glass producers, but exports contribute to more than 80% of sales volumes.

Besides CSR five other production facilities impact the supply dynamics of soda ash in the Balkans region. Solvay / Sisecam, a joint venture company located in Devnya in Northern Bulgaria, with a production capacity almost three times as high as that of CSR, is its key competitor.

The other competitors include Sisecam facilities located in Balikesir in mainland Turkey and Lukavac in Bosnia & Herzegovina, Ciner facility in Kazan in Turkey as well as CrimSoda facility located Krasnoperekopsk in the Crimean Peninsula.

SODA ASH PRODUCTION PLANTS IN THE BALKANS REGION (2018)

CIECH Soda Romania has remained competitive under constant pressure from local peers

DEMAND SUPPLY SITUATION IN EUROPE

European demand for soda ash including Western, Central and Southeast Europe as well as the CIS (Commonwealth of Independent States) Region is estimated at over 11 million tonnes per year.

Market reports put annual growth rates at sustainable levels of 1-2 percent with usually 1 p.p. higher growth dynamics in the CEE than in Western Europe.

The structure of soda ash consumption in Europe has not changed much for many years. The demand for this soda depends mainly on the demand for packaging and flat glass. In Central Europe, the share of the detergent segment is also quite important, while in Eastern Europe the metallurgy industry matters more.

The geography situates soda as a unique resource: only 9 countries in Europe are active soda producers. Europe is a mature soda market with nearly balanced demand and supply volumes which have not undergone rapid changes. Nevertheless, availability of key resources (e.g. brine, limestone) vastly determine the market supply that can be created by European producers.

As for 2018, European demand exceeded the supply by over 1.6 million tonnes. The difference was satisfied with imports mainly from North America and the Middle East. In particular, limited European supply may allow the Middle East players, e.g. Turkey, to start disrupting the current market demand supply structure.

Growing competitiveness can be addressed mainly by optimization of cost structure.

Due to intense local competition focused on exports, production scale and the cost benefits of raw materials and energy are even more critical to remain profitable than in the rest of Europe.

CSR is the only facility in the region which is not vertically integrated with electricity and steam sources as well as brine/limestone reservoirs. These resources are supplied via companies controlled by central or municipal authorities.

It is reported that large Romanian end users of soda ash in the region started to diversify their supplier base to benefit from the proximity of multiple producers.

The launch of the largest natural soda ash production facility in Turkish Kazan exceeding the capacity of 2.6 million tonnes per annum could significantly change the fields of play in the Balkans region and Europe.

There is no significant threat of substitution of soda ash in the end-user industries as well as in the rest of Europe.
CIECH is one of the most important private entities in the local economy in terms of total operating revenue and employment.

**IMPORTANCE OF CIECH IN THE VÂLCEA REGION**

The CIECH Group is ranked fourth in terms of total operating revenue in Vâlcea County. At the same time, it is ranked second among private entities in the city, as Oltchim and CET Govora are state-owned companies.

Moreover, the CIECH Group is the eighth largest employer in Vâlcea County and the fifth largest private employer (as Apavil SA is a municipal company).

**TOP 10 COMPANIES IN VÂLCEA COUNTY BY TOTAL OPERATING REVENUE (ILLUSTRATIVE, 2018)**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oltchim SA (Chemicomplex)</td>
<td></td>
</tr>
<tr>
<td>C.E.T. Govora SA</td>
<td></td>
</tr>
<tr>
<td>Vel Pitar SA</td>
<td></td>
</tr>
<tr>
<td>CIECH Soda Romania</td>
<td></td>
</tr>
<tr>
<td>Diana SRL</td>
<td></td>
</tr>
<tr>
<td>Annabella SRL</td>
<td></td>
</tr>
<tr>
<td>Nurvil SRL</td>
<td></td>
</tr>
<tr>
<td>Boromir Ind SRL</td>
<td></td>
</tr>
<tr>
<td>Sapte Spice SA</td>
<td></td>
</tr>
<tr>
<td>Topanel Production...</td>
<td></td>
</tr>
</tbody>
</table>

**TOP 10 COMPANIES IN VÂLCEA COUNTY BY NUMBER OF EMPLOYEES (2018)**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vel Pitar SA</td>
<td>2,748</td>
</tr>
<tr>
<td>Oltchim SA (Chemicomplex)</td>
<td></td>
</tr>
<tr>
<td>C.E.T. Govora SA</td>
<td></td>
</tr>
<tr>
<td>Annabella SRL</td>
<td>976</td>
</tr>
<tr>
<td>Boromir Ind SRL</td>
<td>843</td>
</tr>
<tr>
<td>Apavil SA</td>
<td>811</td>
</tr>
<tr>
<td>Diana SRL</td>
<td>707</td>
</tr>
<tr>
<td>CIECH Soda Romania</td>
<td>637</td>
</tr>
<tr>
<td>Sapte Spice SA</td>
<td>486</td>
</tr>
<tr>
<td>Diana Com SRL</td>
<td>390</td>
</tr>
</tbody>
</table>

Source: EMIS. The ranking is based on latest available data.

**ACTIVITIES OF THE CIECH GROUP SUPPORTING THE LOCAL COMMUNITY IN VÂLCEA COUNTY**

- **COOPERATION WITH THE LOCAL INSTITUTE OF CULTURE**
- **SUPPORTING THE LOCAL “CASA PINOCHIO” ORPHANAGE**
- **PARTNERSHIP WITH LYCEUM ENERGETIC: SCHOLARSHIPS AND INTERNSHIPS**

Statistics represent both CIECH Group’s companies in Romania: CIECH Soda Romania and CIECH Spółka Akcyjna Varsovia Sucursala Ramnicu Vâlcea.
Perspectives on further business performance at CSR

In this chapter we present the competitive advantages, as well as evaluation of revenue and costs along with the next steps for CIECH Soda Romania.

The key values describing the financial position of CIECH Soda Romania are:

- **RON 443.7 m**
  - of revenue in 2018, up 50% since 2014

- **>500,000 tonnes**
  - of production volumes in 2018, almost doubled over last 10 years

- **44%**
  - share of steam in total operating costs in 1H 2019

- **135%**
  - increase in steam prices, hampering operations, starting in September 2019
CSR sales drivers are sound, but a few risks need to be overcome in the future

**KEY COMPETITIVE ADVANTAGES**

- **SKILLED WORKFORCE**
  Highly skilled workforce helps continuously modernize and improve effectiveness of technical facilities

- **RELIABILITY AND BRAND**
  Leveraging the CIECH brand, CSR is considered as a reliable and trusted commercial partner

- **STRONG EXPORTS**
  Expansion into new profitable overseas markets makes up for stagnation of demand from local customers

- **LONG DISTANCE SHIPPING**
  CSR ships their products to locations as distant as South East Asia, Oceania or South America

- **SMALL LOTS**
  Small sales lots (<1 tonne) help to expand sales into new groups of customers

- **DIRECT SALES**
  Expansion of direct sales to end-users replacing sales to dealers improves operating margins

**BUSINESS ISSUES TO BE ADDRESSED**

1. **STEAM SUPPLY IN SHORT TERM**
   Uncertain, with adverse impact already on the current operations of the Company

2. **LIMESTONE AND BRINE SUPPLY IN LONG TERM**
   Further investments in upscale of CIECH production capacities in Romania are conditional on access to long-term contracts for brine as well as for limestone (including extension of reservoirs in the current location)

3. **INTENSE REGIONAL COMPETITION**
   Due to tough competition from nearby soda ash plants in Bulgaria, Bosnia & Herzegovina as well as Turkey, maintaining production costs at low levels remains critical to continue the business

**KEY RISK FACTORS**

**SALES DYNAMICS**

<table>
<thead>
<tr>
<th>'18 RESULT</th>
<th>COMPARED TO '14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales revenue</td>
<td>RON 443.7 million</td>
</tr>
<tr>
<td>Production volume</td>
<td>&gt; 500,000 tones</td>
</tr>
<tr>
<td>Markets served</td>
<td>72 countries</td>
</tr>
</tbody>
</table>

Substantial growth of sales is a result of successful reorganization of sales operations

Sales revenues increased substantially between 2014 and 2018, with an approximate CAGR of 10%. Owing to efficient sales operations and international expansion, the number is attributable to the improvements in management and operations.

Production volumes have steadily risen due to the modernization of the equipment and improvements to production technology. Over the last ten years the volumes have increased by almost 100%, with potential room to grow further in the future.

This shift lead by expansion into the Asian and South American markets with a substantial increase in the overall number of export markets - from 59 to 72 - an increase of 22% over the 5-year period. The number of business partners on those markets also increased by more than 50% effectively, diversifying the revenue sources.

The last 5 years of activity have realized a strategy focused on strengthening CSR’s own salesforce. The dominant ~70% share of third party traders in sales in 2014 was captured by the dedicated CSR team. The total number of direct sale customers has grown by over 60% over the 2014-2018 period.

Source: EY Analysis based on CIECH Group data

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03 | Perspectives on further business performance at CSR
The cost structure at CSR remained stable from 2014 to 2018, while there are risks reported for 2019

**COST STRUCTURE DYNAMICS**

<table>
<thead>
<tr>
<th>VARIABLE COST (PER OUTPUT TONNE)</th>
<th>‘14 RESULT</th>
<th>ANNUAL CHANGE FROM ‘14 TO ‘18</th>
<th>CHANGE ‘20 FORECAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam and electricity</td>
<td>ca. RON 110 m</td>
<td>+5%</td>
<td>+135%</td>
</tr>
<tr>
<td>Limestone and brine</td>
<td>ca. RON 60 m</td>
<td>+7%</td>
<td>+5%</td>
</tr>
<tr>
<td>Other materials</td>
<td>ca. RON 20 m</td>
<td>+1%</td>
<td>+1%</td>
</tr>
</tbody>
</table>

The cost of energy, including steam as a key ingredient of the cost of energy, steadily rose between 2014 and 2018, with an approximate CAGR of 5%. As the price negotiations with CET Govora continue, the cost of energy in 2020 is expected by CSR to skyrocket by 135%. Over the 2014-2018 period the cost of raw materials was growing by a high single digit number and is expected to increase significantly also in 2019.

The cost of other materials including packaging remained stable from 2014 to 2019 without a significant impact on CSR's bottom line measures.

**FIXED COST (TOTAL)**

<table>
<thead>
<tr>
<th>VARIABLE COSTS</th>
<th>FIXED COSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam and electricity</td>
<td>Employee compensation</td>
</tr>
<tr>
<td>Limestone and brine</td>
<td>Other materials</td>
</tr>
</tbody>
</table>

Energy including steam and raw materials are two critical cost factors which together account for around 70% of the Company's total operating expenses. Changes in the price of either of these factors result in a significant impact on CSR profitability measured by EBIT or net income.

According to our analysis, based on CSR's data, it takes merely a 20% increase in the price of energy per unit production to bring the company's EBIT to zero. For comparison, the same 20% increase in the cost of key raw materials such as limestone and brine would lead to a decline in CSR's EBIT by around 65%.

Potential scarcity of steam supply and other resources provided by exclusive suppliers limiting production volumes may also impact CSR's bottom line.
Price of steam proposed by the supplier - CET Govora - adversely affects business profitability at CSR

PRICES OF TECHNOLOGICAL STEAM FOR CSR

Steam price evolution (illustrative)

Critical impact

High impact

Steam price evolution (illustrative)

Price of steam with CO₂ certificates

Theoretical price of steam without certificates

A 1 April 2019
The price was negotiated to last until the end of 2020. CSR agrees to pay for CO₂ certificates

B 23-24 May 2019
Ceased supply of lignite out of which steam boilers for CSR were fed. Reduction of steam supply for CSR by 20%

C 18 June 2019
CET terminates the contract from 1 April with 3 months notice. Contract expires on 18 Sept. 2019

D 18 Sept. 2019
135% price increase comparing to 2018 will adversely affect CSR’s net income

Source: CIECH Group data

Comparation of share of steam in total operating costs

Although since 2008 CET Govora has systematically raised steam prices for CSR, the management of the cost structure remained a challenge. Nevertheless, it remained under control until recently as the price proposed by CET Govora after 18.09.2019 is 135% higher than 2018 price levels.

With prices of steam up by 135%, its cost will exceed 50% of forecasted total cost structure, which is 17 pp. above 2018 levels (34%) and 7 pp. above 1H 2019 levels (44%) as well as and more than 20 pp. above CIECH Group benchmarks (ca.30%).

Source: CIECH Group data

Nevertheless, future options for business development in CSR remain open

STRATEGIC OPTIONS FOR STEAM SUPPLY CONSIDERED BY CSR IN THE FACE OF NEGOTIATIONS WITH CET GOVORA

SELECTED SCENARIOS:

1 STEAM SUPPLY SOLUTIONS

Negotiations with CET about further cooperation

Creation of a new source of steam at a reasonable cost and long-term contract for other raw materials

Use of available resources to start production with a different profile

Review of strategic options

FUTURE DEVELOPMENT SCENARIOS FOR CSR PROVIDED THE STEAM ISSUE IS FIXED

1 VOLUME EXPANSION

With a significant share of sales on international markets, production volume expansion is a viable option. The macroeconomic data supports this, with 5% of expected CAGR and expected demand coming from the glass and aluminium industries.

Soda ash capacity extension

Approach to the production upscaling can be done with relative ease as an estimated 20% growth in volume can be done without significant capital investment.

2 CORE DIVERSIFICATION

In order to diversify the soda business, it is possible to deploy new facilities extending the presence of CSR within the soda value chain. Stable forecasts for both markets can leverage CSR’s position as entering the consumer market is possible.

New product line facilities - salt products

The introduction of sodium bicarbonate is a moderate investment option as it directly extends production facilities while additionally consuming CO₂, offsetting energy related emissions.

Source: EY Analysis based on CIECH Group data
In this chapter we present the economic impact of operating activities of The CIECH Group in Romania in 2018.

The CIECH Group generated the following effects in the Romanian economy in 2018:

- **RON 445 million** of value added
- **ca. RON 1.3 billion** of global output
- **more than 4,400 jobs**
- **RON 98.4 million** of government revenues
- **RON 286 million** of trade surplus resulting from the net exports of the CIECH Group
**Impact of the CIECH Group on the Romanian economy in 2018 - executive summary**

**KEY FINDINGS**

The CIECH Group affects the economy of Romania not only by:

- Directly generated - gross value added (=GDP), global output (=revenues), employment and government revenues - but also through
- Demand in the supply chain (indirect effects) and
- Increased consumer spending of households (induced effects)

Taking into account the direct, indirect and induced effects, the CIECH Group generated the following effects in the Romanian economy in 2018:

- RON 445 million of value added
- ca. RON 1.3 billion of global output
- more than 4,400 jobs
- RON 98.4 million of government revenues

Sectors benefiting most from the CIECH Group's operational activity in terms of value added (and global output) are:

- Electricity, gas, steam, water, waste and recycling
- Finance, insurance and real estate services
- Mining and quarrying
- Warehousing, transport and telecommunication

The CIECH Group generated the highest numbers of jobs in agriculture, hunting, fishing, forestry and trade.

Of the total amount of government revenues generated by the CIECH Group in Romania, the social security sector received RON 46.5 million, the central budget RON 42.5 million and local government units RON 9.4 million.

**SUMMARY OF EFFECTS IN ROMANIA IN 2018**

**Value added (basic prices, mRON)**

<table>
<thead>
<tr>
<th>Surplus of companies' revenues over the expenses incurred on goods and services that are necessary to conduct current operations (=GDP)</th>
<th>104</th>
</tr>
</thead>
<tbody>
<tr>
<td>222</td>
<td>118</td>
</tr>
<tr>
<td>445</td>
<td></td>
</tr>
</tbody>
</table>

**Global output (basic prices, mRON)**

<table>
<thead>
<tr>
<th>Value of produced / offered goods and services (=revenues)</th>
<th>533</th>
</tr>
</thead>
<tbody>
<tr>
<td>254</td>
<td></td>
</tr>
<tr>
<td>1280</td>
<td></td>
</tr>
</tbody>
</table>

**Government revenues (mRON)**

<table>
<thead>
<tr>
<th>Arising from corporate income taxes (CIT), personal income taxes (PIT), indirect taxes (VAT and excise), social security contributions and property tax</th>
<th>492</th>
</tr>
</thead>
<tbody>
<tr>
<td>637</td>
<td></td>
</tr>
<tr>
<td>192</td>
<td></td>
</tr>
<tr>
<td>1827</td>
<td></td>
</tr>
<tr>
<td>4413</td>
<td></td>
</tr>
</tbody>
</table>

**Employment (persons)**

<table>
<thead>
<tr>
<th>Annual number of persons whose employment is dependent upon the company's activity</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
</tr>
<tr>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

**Demand effects of the CIECH Group**

The CIECH Group impacts the Romanian economy through its own output (expressed as revenue excluding indirect taxes), value added (which is an approximation of impact on GDP), employment as well as taxes and social security contributions paid. These are direct effects of the CIECH Group’s activity.

In order to evaluate the total impact of the CIECH Group on the Romanian economy, we used the EY Spectrum model. It is a combination of input-output model, which is commonly used in Economic Impact Assessment, and spatial econometrics tools.

The EY Spectrum model allows us to take into account so-called demand effects, which result from CIECH’s demand for goods and services generated in the supply chain (indirect effects) and consumer demand reported by the CIECH Group’s and its suppliers' employees (induced effects).

The mechanism of demand effects generation is illustrated below. In our analysis, we measure the direct, indirect and induced impact of the CIECH Group on the following variables: value added, global output, employment and government tax revenues. Definitions of these variables are provided in the corresponding sections.

**Types of effects and measures of impact**

The CIECH Group impacts the Romanian economy through its own output (expressed as revenue excluding indirect taxes), value added (which is an approximation of impact on GDP), employment as well as taxes and social security contributions paid. These are direct effects of the CIECH Group’s activity.

In order to evaluate the total impact of the CIECH Group on the Romanian economy, we used the EY Spectrum model. It is a combination of input-output model, which is commonly used in Economic Impact Assessment, and spatial econometrics tools.

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The mechanism of demand effects generation is illustrated below. In our analysis, we measure the direct, indirect and induced impact of the CIECH Group on the following variables: value added, global output, employment and government tax revenues. Definitions of these variables are provided in the corresponding sections.
**Impact on value added in Romania in 2018 - sectorial breakdown**

**AS A RESULT OF THE OPERATIONAL ACTIVITY OF THE CIECH GROUP, CA. RON 445 MILLION OF VALUE ADDED WAS GENERATED IN ROMANIA IN 2018.**

Of the total impact, RON 104 million (23%) are a direct effect of the operational activity of the CIECH Group, RON 222 million (50%) are the indirect effects and RON 119 million (27%) are the induced effects.

Sectors benefiting most from the CIECH Group’s operational activity in terms of value added are: (1) electricity, gas, steam, water, waste and recycling, (2) finance, insurance and real estate services, (3) mining and quarrying, (4) warehousing, transport and telecommunication. Those four sectors accounted for 44% (RON 150 million) of total demand effects for value added generated by the CIECH Group in 2018.

Relatively high indirect effects on value added in the “Electricity, gas, steam, water, waste and recycling” sector result from significant costs incurred by companies from the CIECH Group on process steam and electricity.

**EFFECTS FOR VALUE ADDED (BASIC PRICES, mRON)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Direct effects</th>
<th>Indirect effects</th>
<th>Induced effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciech Romania</td>
<td>104.3</td>
<td>74.8</td>
<td></td>
</tr>
<tr>
<td>Electricity, gas, steam, water, waste and recycling</td>
<td>35.9</td>
<td>27.4</td>
<td></td>
</tr>
<tr>
<td>Finance, insurance and real estate (services)</td>
<td>26.3</td>
<td>22.3</td>
<td></td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>27.4</td>
<td>26.3</td>
<td></td>
</tr>
<tr>
<td>Warehousing, transport and telecommunication</td>
<td>18.9</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>Trade</td>
<td>18.9</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>Business support services</td>
<td>12.2</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td>Education, research and development</td>
<td>12.2</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td>Food industry</td>
<td>13.0</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Chemical industry</td>
<td>13.0</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Agriculture, hunting, fishing, forestry</td>
<td>8.1</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>8.1</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Light industry</td>
<td>6.7</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>Accommodation, catering, entertainment and culture</td>
<td>3.4</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Repair and installation of machinery and equipment</td>
<td>3.4</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Metals industry</td>
<td>3.4</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td>Other services</td>
<td>48.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>104.3</td>
<td>222.1</td>
<td>444.8</td>
</tr>
</tbody>
</table>

Source: EY calculation with the use of the EY Spectrum model, based on the CIECH Group data.

*Detailed explanation in Appendix E. Value added presented in this report is gross value added expressed in basic prices (and thus does not include production taxes, mainly VAT and excise duties).*

**Impact on global output in Romania in 2018 - sectorial breakdown**

**AS A RESULT OF THE OPERATIONAL ACTIVITIES OF THE CIECH GROUP, CA. RON 1.3 BILLION OF GLOBAL OUTPUT WAS GENERATED IN ROMANIA IN 2018.**

Of the total impact, RON 492 million (38%) are the direct effects of the operational activity of the CIECH Group, RON 533 million (42%) are the indirect effects and RON 254 million (20%) are the induced effects.

Sectors benefiting most from the CIECH Group’s operational activity in terms of global output are analogous to those which benefit most in terms of value added: (1) electricity, gas, steam, water and recycling, (2) trade, (3) warehousing, transport and telecommunication and (4) mining and quarrying.

**EFFECTS FOR GLOBAL OUTPUT (BASIC PRICES, mRON)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Direct effects</th>
<th>Indirect effects</th>
<th>Induced effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciech Romania</td>
<td>492.3</td>
<td>218.0</td>
<td>64.5</td>
</tr>
<tr>
<td>Electricity, gas, steam, water and recycling</td>
<td>64.5</td>
<td>60.3</td>
<td></td>
</tr>
<tr>
<td>Trade</td>
<td>64.5</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td>Warehousing, transport and telecommunication</td>
<td>40.8</td>
<td>36.8</td>
<td></td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>40.8</td>
<td>36.8</td>
<td></td>
</tr>
<tr>
<td>Finance, insurance and real estate (services)</td>
<td>46.2</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td>Chemical industry</td>
<td>46.2</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td>Business support services</td>
<td>29.3</td>
<td>24.2</td>
<td></td>
</tr>
<tr>
<td>Food industry</td>
<td>22.6</td>
<td>22.6</td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>29.3</td>
<td>24.2</td>
<td></td>
</tr>
<tr>
<td>Light industry</td>
<td>18.8</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>Agriculture, hunting, fishing, forestry</td>
<td>18.8</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>Education, research and development</td>
<td>10.9</td>
<td>10.9</td>
<td></td>
</tr>
<tr>
<td>Accommodation, catering, entertainment and culture</td>
<td>9.9</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>Repair and installation of machinery and equipment</td>
<td>88.1</td>
<td>88.1</td>
<td></td>
</tr>
<tr>
<td>Metals industry</td>
<td>88.1</td>
<td>88.1</td>
<td></td>
</tr>
<tr>
<td>Other services</td>
<td>88.1</td>
<td>88.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>492.3</td>
<td>533.2</td>
<td>1,279.8</td>
</tr>
</tbody>
</table>

Source: EY calculation with the use of the EY Spectrum model, based on the CIECH Group data.

*Detailed explanation in Appendix E. Value added presented in this report is gross value added expressed in basic prices (and thus does not include production taxes, mainly VAT and excise duties).*
Impact on government revenues in Romania in 2018

THROUGH DIRECT, INDIRECT AND INDUCED EFFECTS, THE CIECH GROUP GENERATED RON 98.4 MILLION OF GOVERNMENT TAX REVENUES IN 2018.

The main source of tax revenues were social security contributions, which reached RON 46.5 million, followed by PIT (RON 14.8 million) and CIT (RON 14.4 million). Excise duties amounted to RON 12.4 million and VAT to RON 9.7 million.

Of the total RON 98.4 million, the social security sector received RON 46.5 million (47%) and the central budget received RON 42.5 million (43%). Revenues of local government units amounted to RON 9.4 million (10%).¹

GOVERNMENT REVENUES BY SOURCE (mRON)

GOVERNMENT REVENUES BY BENEFICIARY

Governments received RON 98.4 mn (EUR 21 mn) of government revenues generated in Romania in 2018.

Source: EY calculation with the use of the EY Spectrum model, based on the CIECH Group data.

1 This value includes algorithmic distribution of part of PIT and VAT revenues to local governments of counties and municipalities/communes, as well as direct effect in property tax.

Impact on employment in Romania in 2018 - sectorial breakdown

AS A RESULT OF THE OPERATIONAL ACTIVITY OF THE CIECH GROUP, MORE THAN 4,400 JOBS WERE CREATED IN ROMANIA IN 2018.

The estimated effects account for the average annual number of persons whose employment is dependent upon the company’s activity through direct, indirect and induced effects.

Sectors benefiting most from the CIECH Group’s operational activity in terms of employment are: (1) agriculture, hunting, fishing, forestry, (2) trade, (3) electricity, gas, steam, water, waste and recycling and (4) mining and quarrying.

Relatively high induced effects for the labor market in the agricultural sector result from: (1) a relatively high share of expenses on food in employees’ expenditure and (2) a relatively low labor productivity in agriculture in Romania compared to other sectors of the economy.

The low labor productivity (high labor intensity) in the agricultural sector means that in order to increase production in agriculture to meet additional demand (reported e.g. by the food industry), it is necessary to increase employment more in many other industries.

OF THE TOTAL NUMBER OF JOBS, 637 (14%) WERE CREATED DIRECTLY BY THE TWO COMPANIES FROM THE CIECH GROUP, 1,949 JOBS (44%) WERE CREATED THROUGH THE INDIRECT EFFECTS AND 1,827 (41%) THROUGH THE INDUCED EFFECTS.

The estimated effects account for the average annual number of persons whose employment is dependent upon the company’s activity through direct, indirect and induced effects.

Sectoral overview

INDIRECT EFFECTS AND INDUCED EFFECTS

Indirect effects and induced effects created through the indirect effects.

EFFECTS FOR EMPLOYMENT (PERSONS)

The Corporate Report CIECH

47% Social Security Sector

43% Central budget

10% Local government budgets

Direct effects Indirect effects Induced effects

Direct effects

Indirect effects and induced effects

Source: EY calculation with the use of the EY Spectrum model, based on the CIECH Group data.
Impact on balance of payments in Romania in 2018

THE IMPACT OF THE CIECH GROUP ON THE TRADE BALANCE OF ROMANIA IN 2018 AMOUNTED TO RON 286 MILLION.

The Balance of Payments (BOP) is a macro-economic indicator used to assess the position of an economy towards the external world. It summarizes all economic transactions between the residents and the non-residents of a country during a given period.

The CIECH Group in Romania generated direct impact on the balance of trade in 2018 resulting from the value of net exports of goods and services (the difference between the value of exports and imports).

The impact of the CIECH Group on the balance of trade in Romania in 2018 amounted to RON 286 million (EUR 61 million).

EFFECTS ON THE BALANCE OF PAYMENTS OF ROMANIA IN 2018 (mRON)

<table>
<thead>
<tr>
<th>Exports</th>
<th>Imports</th>
<th>Impact on the balance of trade of Romania</th>
</tr>
</thead>
<tbody>
<tr>
<td>365</td>
<td>79</td>
<td>286</td>
</tr>
</tbody>
</table>

RON 286 mn (EUR 61 mn) of trade surplus in 2018 resulting from the net exports of the CIECH Group.

Summary of estimated effects on value added, employment and government revenues - multipliers

THE CIECH GROUP (DIRECT EFFECTS)

- RON 1 mn of the value added generated by the CIECH Group
- 1 job in the CIECH Group
- RON 1 mn of government revenues generated by the CIECH Group

THE REST OF THE ECONOMY (INDIRECT AND INDUCED EFFECTS)

- RON 3.3 mn of the value added generated in the rest of the economy
- 5.9 jobs in the rest of the economy
- RON 3.1 mn of government revenues generated in the rest of the economy

Source: EY calculation with the use of the EY Spectrum model, based on the CIECH Group data.

Source: EY calculation based on the CIECH Group data.
In this chapter we present the impact of the CIECH Group on the economy of the Vâlcea county.

The CIECH Group generated the following effects in the Vâlcea county in 2018:

- **RON 260 million** of value added
- **ca. RON 869 million** of global output
- **above 2,160 jobs**
- **RON 4.5 million** of local government revenues
Impact of the CIECH Group on the economy of the Vâlcea county in 2018 - executive summary

KEY FINDINGS

A significant share of the effects generated by the CIECH Group in Romania can be attributed to the Vâlcea county. The CIECH Group is one of the biggest companies and one of the biggest employers in Râmnicu Vâlcea, the capital of the region.

The following sectors in the Vâlcea county benefited most from the CIECH Group’s operating activity in terms of value added:

- Electricity, gas, steam, water, waste and recycling,
- Mining and quarrying,
- Warehousing, transport and telecommunication.

The CIECH Group generated RON 4.5 million of local government revenues in the Vâlcea county, which constitutes 44% of the total tax revenues of communes, municipalities and counties generated by the CIECH Group in Romania.

THE CIECH GROUP GENERATED RON 260 MILLION OF VALUE ADDED IN THE VÂLCEA COUNTY IN 2018.

The effects generated in Vâlcea constitute 58% of the overall value added generated by the CIECH Group in Romania. Of the total impact in Vâlcea in 2018, RON 104 million (40%) can be attributed to direct effects, RON 111 million (43%) to indirect effects and RON 44 million (17%) to induced effects.

With regard to sectorial distribution of the demand effects on value added in the Vâlcea county, the largest effects were generated in (1) electricity, gas, steam, water, waste and recycling (RON 57 million); (2) mining and quarrying (RON 16 million) and (3) finance, insurance and real estate services (RON 15 million).

The effects for value added generated by the CIECH Group in the Vâlcea county accounted for 2.7% of value added created in the region in 2016.

Regional structure of total effects for value added (basic prices, mRON)

The following effects in the Vâlcea county were generated in 2018:

- RON 260 million of value added
- ca. RON 869 million of global output
- above 2,160 jobs
- RON 4.5 million of local government revenues

Source: EY calculation with the use of the EY Spectrum model, based on the CIECH Group data. ¹ In order to evaluate the impact of the CIECH Group on the economy of the Vâlcea county, we used the EY Spectrum model. The description of our approach to the analysis can be found in Appendix B.
Impact on global output in Romania in 2018 - regional effects

THE CIECH GROUP GENERATED RON 869 MILLION OF GLOBAL OUTPUT IN THE VÂLCEA COUNTY IN 2018.

The effects generated in Vâlcea constitute 68% of the overall global output generated by the CIECH Group in Romania. Of the total annual impact in Vâlcea, RON 492 million (57%) can be attributed to direct effects, RON 286 million (33%) to indirect effects and RON 91 million (10%) to induced effects.

With regard to sectorial distribution of the demand effects on global output in the Vâlcea county, the largest effects were generated in the following sectors: (1) electricity, gas, steam, water, waste and recycling (RON 167 million); (2) mining and quarrying (RON 35 million) and (3) trade (RON 29 million).

REGIONAL STRUCTURE OF TOTAL EFFECTS FOR GLOBAL OUTPUT (BASIC PRICES, mRON)

The effects generated in Vâlcea constitute 68% of the overall global output generated by the CIECH Group in Romania.

Impact on employment in Romania in 2018 - regional effects

THE CIECH GROUP SUPPORTED 2,162 JOBS IN THE VÂLCEA COUNTY IN 2018.

The effects generated in Vâlcea constitute 49% of the overall employment created by the CIECH Group in Romania. Of the total annual impact in Vâlcea, 637 jobs (29%) can be attributed to direct effects, 948 (44%) to indirect effects and 577 (27%) to induced effects.

With regard to sectorial distribution of the demand effects on employment in the Vâlcea county, the highest number of jobs were created in (1) electricity, gas, steam, water, waste and recycling (306); (2) trade (277); (3) mining and quarrying (179) and (4) agriculture, hunting, fishing, forestry (171).

REGIONAL STRUCTURE OF TOTAL EFFECTS FOR EMPLOYMENT (PERSONS)

The effects for employment generated by the CIECH Group in Vâlcea county accounted for 1.5% of employment in the region in 2016.¹

¹ We present the relative effects in relation to the year, for which the latest regional data for Romania is available (source: Eurostat).
Impact on local government revenues in Romania in 2018

THROUGH DIRECT, INDIRECT AND INDUCED EFFECTS, IN 2018, THE CIECH GROUP GENERATED RON 4.5 MILLION OF TAX REVENUES IN THE VÂLCEA COUNTY.

The effects generated in Vâlcea constitute 44% of the total tax revenues of communes, municipalities and counties generated by the CIECH Group in Romania. Besides the Vâlcea county, the main beneficiaries of the CIECH Group activity in terms of tax revenues are Arges (RON 1.4 million), Gorj (RON 595 thous.) and Dâmbovița county (RON 131 thous.).

The effects for tax revenues generated by the CIECH Group in the Vâlcea county account for 0.4% of the total tax revenues received by the region in 2017.

The effects generated in Vâlcea constitute 44% of the total tax revenues of communes, municipalities and counties generated by the CIECH Group in Romania. Besides the Vâlcea county, the main beneficiaries of the CIECH Group activity in terms of tax revenues are Arges (RON 1.4 million), Gorj (RON 595 thous.) and Dâmbovița county (RON 131 thous.).

The effects for tax revenues generated by the CIECH Group in the Vâlcea county account for 0.4% of the total tax revenues received by the region in 2017.

TAX REVENUES OF COMMUNES, MUNICIPALITIES AND COUNTIES (mRON)

Source: EY calculation with the use of the EY Spectrum model, based on the CIECH Group data.

¹ We present the relative effects in relation to the year, for which the latest regional data for Romania is available (source: Eurostat).
Appendix A: Soda is critical for production of industrial, household and agricultural products (1/2)

WHAT IS SODA?

Soda is a family of chemical compounds containing sodium, a soft, silvery-white, reactive metal.

The wide spectrum of applications for sodium compounds makes soda a high-demand and commonly used base chemical. It is a critical resource for various industries including glass, detergent, pharmaceutical, food and metallurgy.

Soda ash is the name for commercially manufactured anhydrous sodium carbonate, also known as soda crystals. It is made from reaction of sodium and carbonic acid. Sodium carbonate has great disinfecting ability as well as the capability to decompose silicates in quartz sand. These unique properties make soda ash a commonly used raw material in the production of glass, paper, soaps and detergents as well as fibres. About 50% of soda ash produced worldwide is used for the manufacture of glass. Moreover, it is also used as a water softener.

The wide range of applications of baking soda is due to its anti-caking, cleaning and acid neutralizing properties. It is used primarily for the production of food (e.g. as a component of baking powders and effervescent beverages), feed (e.g. as an acidity regulator), detergents and cosmetics, pharmaceuticals, as well as for flue gas purification (mainly for desulfurization). It is also used in the chemical industry for the production of dyes and explosives and as a basic component of fire extinguishers.

Caustic soda is available in solid, flake, or powder form as well as water solution. Caustic soda has applications in the manufacturing of glass, plastics and soaps as well as synthetic fibres including rayon and polyester. It is also used in the pulp & paper industry to process wood fibres as well as to make wood pulp. It is also used as a bleaching agent for neutralizing bleached pulp and paper, as well as for de-inking of waste papers.

Evaporated salt (Sodium chloride) is known as soda crystals. It is made commercially manufactured from sodium chloride which is also widely used in the pharmaceutical and food industry as well as in construction of buildings and road maintenance.

Caustic soda in an aqueous solution is the name for soda ash only.

Soda ash is critical for production of industrial, household and agricultural products (2/2)

SODA ASH PRODUCTION PROCESS

There are two methods to obtain soda ash - from natural resources or synthetic production. In the natural environment it occurs in particular mineral waters and in mineral deposits of certain springs (e.g. Wyoming’s Green River Basin - the world’s purest, largest deposit of trona). However, most global soda ash is produced in chemical facilities from several raw materials.

Currently, two developed production methods of soda ash are commonly used - the Leblanc process and Ernest Solvay process (also called the ammonia-soda process). Invented in 1861, Solvay’s method proved to be more ecological and nowadays is the world’s major industrial process for the production of soda ash (about 70% of global soda ash production). The principal product of the Solvay process is sodium bicarbonate (baking soda). After heating at 300°C sodium carbonate (soda ash) is formed. The byproduct of this chemical reaction is calcium chloride which is also widely used in the pharmaceutical and food industry as well as in construction of buildings and road maintenance.
Appendix B: Economic Impact Assessment - calculation of the regional effects

**EY SPECTRUM MODEL**

The demand reported by the CIECH Group is satisfied by companies located all around the country. The EY Spectrum model used for the analysis enables us to evaluate demand effects not only in the sectorial, but also in the regional breakdown. We have estimated how much of the total effects can be attributed to the Vâlcea county.

We estimated the economic effects based on the data on the scale and structure of the CIECH Group's operational costs, covering expenditure on products and services of its suppliers. The EY Spectrum model takes into account not only what sectors supply the CIECH Group's entities in Romania, but also where the suppliers are located. The WIOD input-output tables published in 2014, which divide the economy into 56 sectors\(^1\), were used to track the circulation of the initial spending in the economy.

The spatial spread of economic effects was established by the EY Spectrum model with the use of input-output tables. The model allows us to determine the regional structure of trade for each pair of sectors.

Two key factors are taken into account in the model: (i) the distance between regions (in some sectors, e.g. basic services, enterprises are less willing to purchase from remote suppliers) and (ii) limitations on the availability of certain types of goods/services in some geographic areas (e.g. coal mines are only available at predetermined places). The EY Spectrum model for Romania was constructed for the regions at the NUTS-3 level. The NUTS-3 regional breakdown divides Romania into 42 regions which are equivalent to the Romanian official administrative divisions of 41 counties and Bucharest.

\(^1\) The WIOD sectors are listed in the Appendix C. In this report, for the presentation purposes, the calculated effects are shown in aggregated form, covering 16 sectors. The aggregation of 56 sectors into 16 sectors is also presented in the Appendix C.

**REGIONAL EFFECTS OF COMPANY’S OPERATIONS - ILLUSTRATIVE EXAMPLE**

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Appendix C: Aggregation of 56 WIOD sectors into 16 sectors presented in the Report (2/2)

<table>
<thead>
<tr>
<th>NO.</th>
<th>NAME OF THE SECTOR IN WIOD</th>
<th>NAME OF THE AGREGATED SECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Construction</td>
<td>Construction</td>
</tr>
<tr>
<td>28</td>
<td>Wholesale and retail trade of motor vehicles and motorcycles</td>
<td>Trade</td>
</tr>
<tr>
<td>29</td>
<td>Wholesale trade, except of motor vehicles and motorcycles</td>
<td>Trade</td>
</tr>
<tr>
<td>30</td>
<td>Retail trade, except of motor vehicles and motorcycles</td>
<td>Trade</td>
</tr>
<tr>
<td>31</td>
<td>Land transport and transport via pipelines</td>
<td>Warehousing, transport and telecommunication</td>
</tr>
<tr>
<td>32</td>
<td>Water transport</td>
<td>Warehousing, transport and telecommunication</td>
</tr>
<tr>
<td>33</td>
<td>Air transport</td>
<td>Warehousing, transport and telecommunication</td>
</tr>
<tr>
<td>34</td>
<td>Warehousing and support activities for transportation</td>
<td>Warehousing, transport and telecommunication</td>
</tr>
<tr>
<td>35</td>
<td>Postal and courier activities</td>
<td>Warehousing, transport and telecommunication</td>
</tr>
<tr>
<td>36</td>
<td>Accommodation and food service activities</td>
<td>Accommodation, catering, entertainment and culture</td>
</tr>
<tr>
<td>37</td>
<td>Publishing activities</td>
<td>Accommodation, catering, entertainment and culture</td>
</tr>
<tr>
<td>38</td>
<td>Motion picture, video and television programme production, sound recording and music publishing activities</td>
<td>Accommodation, catering, entertainment and culture</td>
</tr>
<tr>
<td>39</td>
<td>Telecommunications</td>
<td>Warehousing, transport and telecommunication</td>
</tr>
<tr>
<td>40</td>
<td>Computer programming, consultancy and related activities</td>
<td>Business support services</td>
</tr>
<tr>
<td>41</td>
<td>Financial service activities, except insurance and pension funding</td>
<td>Finance, insurance and real estate (services)</td>
</tr>
<tr>
<td>42</td>
<td>Insurance, reinsurance and pension funding, except compulsory social security</td>
<td>Finance, insurance and real estate (services)</td>
</tr>
<tr>
<td>43</td>
<td>Activities auxiliary to financial services and insurance activities</td>
<td>Finance, insurance and real estate (services)</td>
</tr>
<tr>
<td>44</td>
<td>Real estate activities</td>
<td>Finance, insurance and real estate (services)</td>
</tr>
<tr>
<td>45</td>
<td>Legal and accounting activities</td>
<td>Business support services</td>
</tr>
<tr>
<td>46</td>
<td>Architectural and engineering activities</td>
<td>Education, research and development</td>
</tr>
<tr>
<td>47</td>
<td>Scientific research and development</td>
<td>Education, research and development</td>
</tr>
<tr>
<td>48</td>
<td>Advertising and market research</td>
<td>Business support services</td>
</tr>
<tr>
<td>49</td>
<td>Other professional, scientific and technical activities</td>
<td>Education, research and development</td>
</tr>
<tr>
<td>50</td>
<td>Administrative and support service activities</td>
<td>Business support services</td>
</tr>
<tr>
<td>51</td>
<td>Public administration and defence</td>
<td>Other services</td>
</tr>
<tr>
<td>52</td>
<td>Education</td>
<td>Education, research and development</td>
</tr>
<tr>
<td>53</td>
<td>Human health and social work activities</td>
<td>Other services</td>
</tr>
<tr>
<td>54</td>
<td>Other service activities</td>
<td>Other services</td>
</tr>
<tr>
<td>55</td>
<td>Activities of households as employers</td>
<td>Other services</td>
</tr>
<tr>
<td>56</td>
<td>Activities of extraterritorial organizations and bodies</td>
<td>Other services</td>
</tr>
</tbody>
</table>

GLOBAL OUTPUT (REVENUES) AND VALUE ADDED

The sum of value added of all companies is a useful measure of production volume in an economy. It is worth noting that gross domestic production (GDP) is equal to the sum of value added generated by all resident companies, additionally adjusted for subsidies on products and taxes (primarily VAT). Contrary to value added, when calculating global output, the value of intermediate goods generated at earlier stages of the supply chain is not excluded. In order to enhance the understanding of why value added is a more appropriate measure of production volume than revenues, a simplified example of two entities may be considered: (1) an energy producer and (2) a manufacturer.

Assume that the energy producer sells electricity worth RON 1 million to the manufacturer and consumes products and services of other companies worth RON 0.6 million. In this case, energy producer generates revenue of RON 1 million and value added of RON 0.4 million.

For simplicity, let's assume that the manufacturer consumes only electricity. Thus, its expenses on products and services related to current activity amount to RON 1 million. Thanks to electricity, it sells products worth RON 1.3 million to final consumers. Hence, it generates revenue of RON 1.3 million and value added of RON 0.3 million.

It can be seen that the sum of companies' revenue reaches RON 2.3 million and the sum of their value added amounts to RON 0.7 million.

However, if the companies merged into one enterprise, its revenue would amount to RON 1.3 million (manufactured goods would become the only products sold by the merged enterprise), while its added value would still be equal to RON 0.7 million (excluding possible synergy effect that could result in a potential increase in efficiency). Thus, the exclusion of intermediate consumption allows us to quantify the new value in the economy.
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