

RioTinto

# Jadar Project Overview

Mining for Generations, 3<sup>rd</sup> Mining Academy in CEE

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145 GODINA

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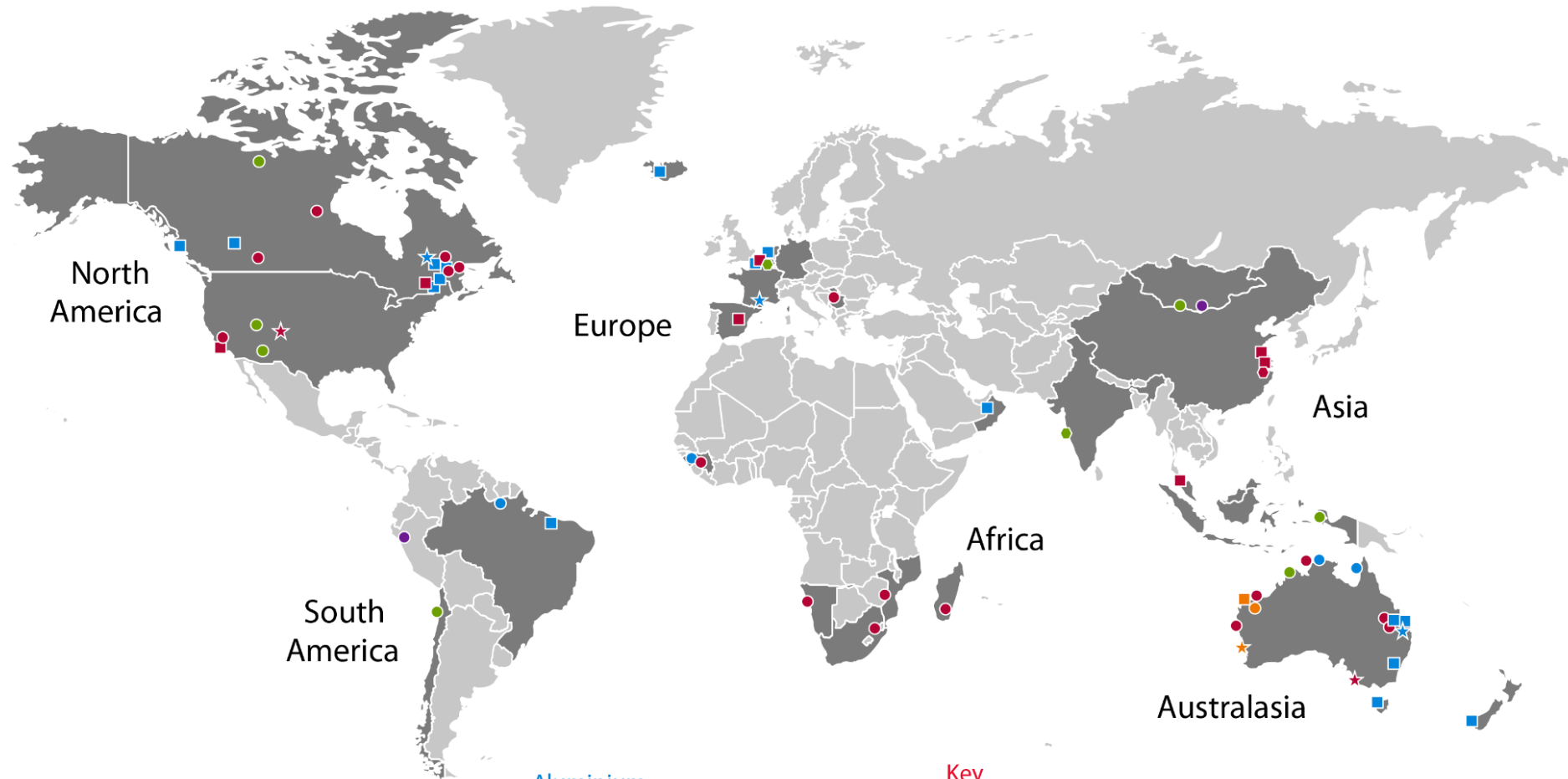
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# Where we operate

at December 2017

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Aluminium  
Copper & Diamonds  
Energy & Minerals  
Iron Ore  
Growth & Innovation

### Key

- Mines and mining projects
- Smelters, refineries, processing plants, port, rail, shipping and power facilities remote from mine
- ◆ Sales and marketing
- ★ Technology and innovation centres

# Essential materials for a modern world

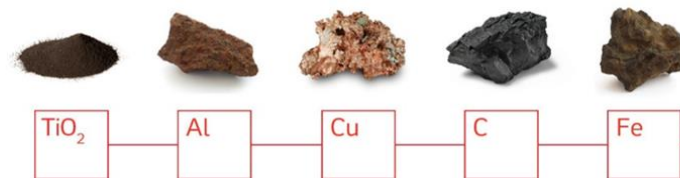
We supply important metals and minerals that make modern life work. Here are some examples:

**Aluminium&Iron ore:** Transportation, machinery, construction, packaging and electrical materials

**Borates:** Home insulation, fertilisers, and the heat-resistant glass used in smartphones, tablets and TVs

**Copper:** Found in nearly every home, office and vehicle. Also used in renewable energy systems such as wind and solar power

**Diamonds:** Over half a billion men and women own at least one piece of diamond jewellery



# The Jadar Project

Дрина

Лозница

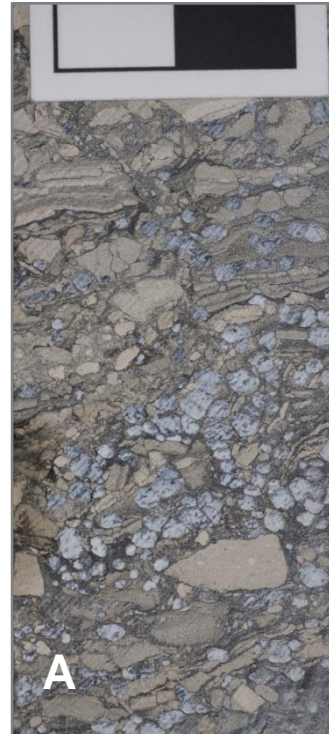
Тамнава

Колуба

# Jadarite – A unique Lithium-Borosilicate

## Jadarite

- Lithium-sodium-borosilicate mineral ( $\text{LiNaSiB}_3\text{O}_7\text{OH}$ ) comprising 47.2%  $\text{B}_2\text{O}_3$  and 7.3%  $\text{Li}_2\text{O}$ .



**Want to know if we've found Kryptonite?**

We discovered a new mineral, jadarite, which is an important source of lithium which is used to power electric vehicles. Learn how else we're pioneering progress at [riotinto.com](http://riotinto.com)



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# History – A Rio Tinto Discovery

<b>2000's</b>	<ul style="list-style-type: none"><li>➤ Rio Tinto Exploration discovers borates in western Serbia and jadarite – a new mineral</li></ul>
<b>2007-2010</b>	<ul style="list-style-type: none"><li>➤ Order of magnitude study and drilling to gain orebody knowledge</li></ul>
<b>2010-2014</b>	<ul style="list-style-type: none"><li>➤ Mining and Metallurgical studies, Pilot plant at Rio Tinto's Boron operation in California, improved orebody knowledge and resource modelling</li></ul>
<b>2016-2018</b>	<ul style="list-style-type: none"><li>➤ Pre-feasibility, enhanced process testwork at RT Technology Centre</li></ul>



# Jadar – Resource Profile and Mineralogy

## 100% owned by Rio Tinto

- 136 Mt mineral resource<sup>(1)</sup>:
  - Indicated: 52 Mt @ 1.8% Li<sub>2</sub>O, 19.2% B<sub>2</sub>O<sub>3</sub>
  - Inferred: 83 Mt @ 1.9% Li<sub>2</sub>O, 13.0% B<sub>2</sub>O<sub>3</sub>
  
- Contains:
  - 2.5Mt lithium oxide (Li<sub>2</sub>O)
  - 21Mt borates (B<sub>2</sub>O<sub>3</sub>)
  
- Long potential mine life

Alongside **Jadarite**, **Ezcurrite** (Na<sub>4</sub>B<sub>10</sub>O<sub>17</sub>·7H<sub>2</sub>O) is most common mineral. **Kernite** (Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>·4H<sub>2</sub>O) and **Borax** (Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>·10H<sub>2</sub>O) also present.

	Mineral	Formula	%B <sub>2</sub> O <sub>3</sub>	%Li <sub>2</sub> O
Borates	Ezcurrite	Na <sub>4</sub> B <sub>10</sub> O <sub>17</sub> ·7H <sub>2</sub> O	58.2	-
	Kernite	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ·4H <sub>2</sub> O	50.9	-
	Borax	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ·10H <sub>2</sub> O	47.2	-
	Ulexite	NaCaB <sub>5</sub> O <sub>9</sub> ·8H <sub>2</sub> O	42.9	-
	Colemanite	Ca <sub>2</sub> B <sub>6</sub> O <sub>11</sub> ·5H <sub>2</sub> O	50.8	-
	<b>Jadarite</b>	LiNaSiB <sub>3</sub> O <sub>7</sub> (OH)	47.2	7.3
Li - Rich Minerals	Spodumene	LiAlSi <sub>2</sub> O <sub>6</sub>	-	8.0
	Lepidolite	K <sub>2</sub> Li <sub>3</sub> Al <sub>3</sub> (AlSi <sub>3</sub> O <sub>10</sub> ) <sub>2</sub> (O,OH,F) <sub>4</sub>	-	5.4
	Petalite	LiAlSi <sub>4</sub> O <sub>10</sub>	-	4.9

(1) Resource estimate as released to the market in the 2017 Rio Tinto Annual Report on 2 March 2018. The Competent Persons responsible for reporting of those Mineral Resources were M Sweeney and J Garcia. Rio Tinto is not aware of any new information or data that materially affects the above resource estimate as reported in the 2017 Annual Report, and confirms that all material assumptions and technical parameters underpinning this estimate continue to apply and have not materially changed. The form and context in which each Competent Person's findings are presented have not been materially modified.



# Operating Cost Implications

Lithium production with Boric Acid by-product moves Jadar hard-rock project down the cost-curve



Brine - low cost

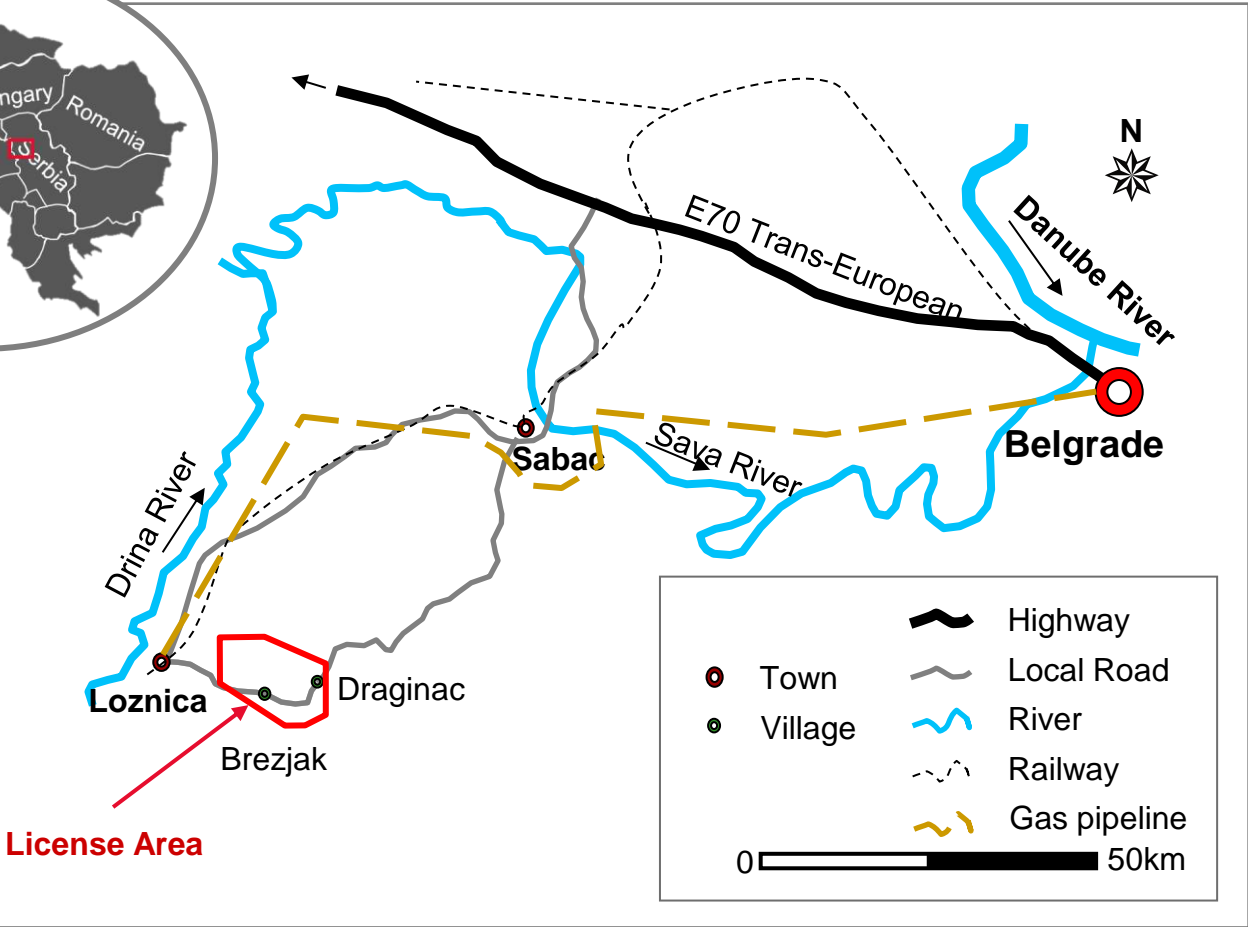
Hard rock - low cost

Brine - high cost

Hard rock - high cost

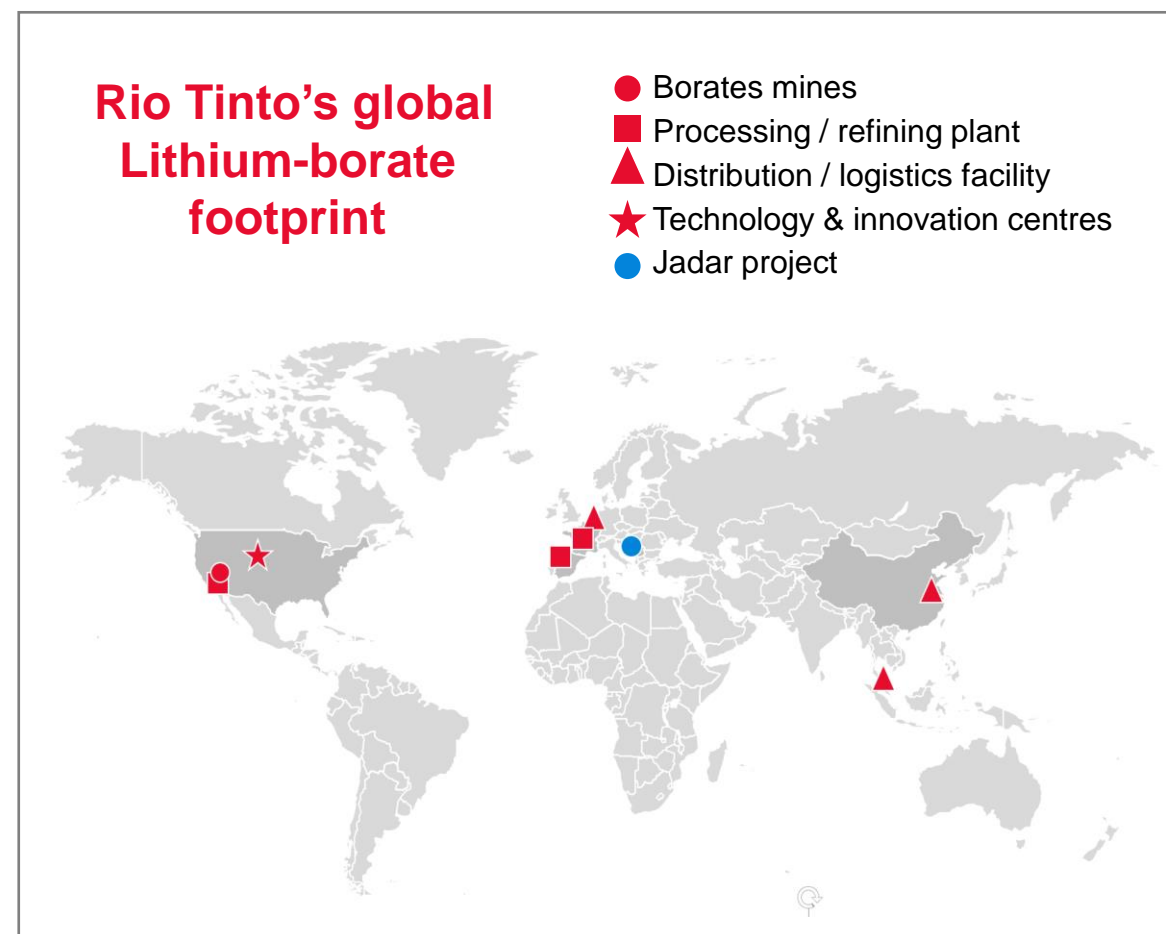
Indicative 2025 lithium carbonate cost curve

# Jadar Valley – Northwestern Serbia



# Attractive Serbian investment climate combined with existing Rio Tinto infrastructure

<b>Attractive Serbian investment climate</b>	<ul style="list-style-type: none"><li>▪ On track for EU membership</li><li>▪ Established mining jurisdiction</li><li>▪ Mining code updated in 2015</li><li>▪ Supportive government</li></ul>
<b>Local infrastructure</b>	<ul style="list-style-type: none"><li>▪ Skilled and productive labor force</li><li>▪ Competitive operating costs</li></ul>
<b>Rio Tinto infrastructure</b>	<ul style="list-style-type: none"><li>▪ Existing boric acid production / market presence</li><li>▪ Infrastructure in Americas, Europe, Asia</li></ul>
<b>Access to market</b>	<ul style="list-style-type: none"><li>▪ Multiple transportation options</li><li>▪ On doorstep of 2<sup>nd</sup> biggest EV market</li><li>▪ Customs free access to scale markets from EU membership</li></ul>



# Jadar Project

- Greenfield underground mine
- On site plant producing battery grade lithium carbonate and boric acid
- Potential production start up early 2020's

