

**Base Update - what is the implication, if any, from the Vale tailings dam disaster**

*We offer our condolences to all those affected by this disaster ...*

The bursting of the tailings dams at mine near Brumadinho, Brazil on January 25th is a national disaster . This is the 2nd tailings collapse in the past 3 years (Samarco\* broke in Nov 15 killing 19 people and was considered the largest environmental disaster in Minas Gerais). Currently there are still more than 300 people missing, after 65 deaths. Authorities have arrested employees and engineers deemed responsible and another 7 search warrants have been issued; \$3bn in assets have been frozen by state courts to pay for expected damages; Fitch downgraded Vales rating “on the expectation that the company will incur heavy repatriation costs as a result of the accident and the expectation of decreased production in the near-to-intermediate term and additional capex for remediation and other possible expenditures to ensure safety...”

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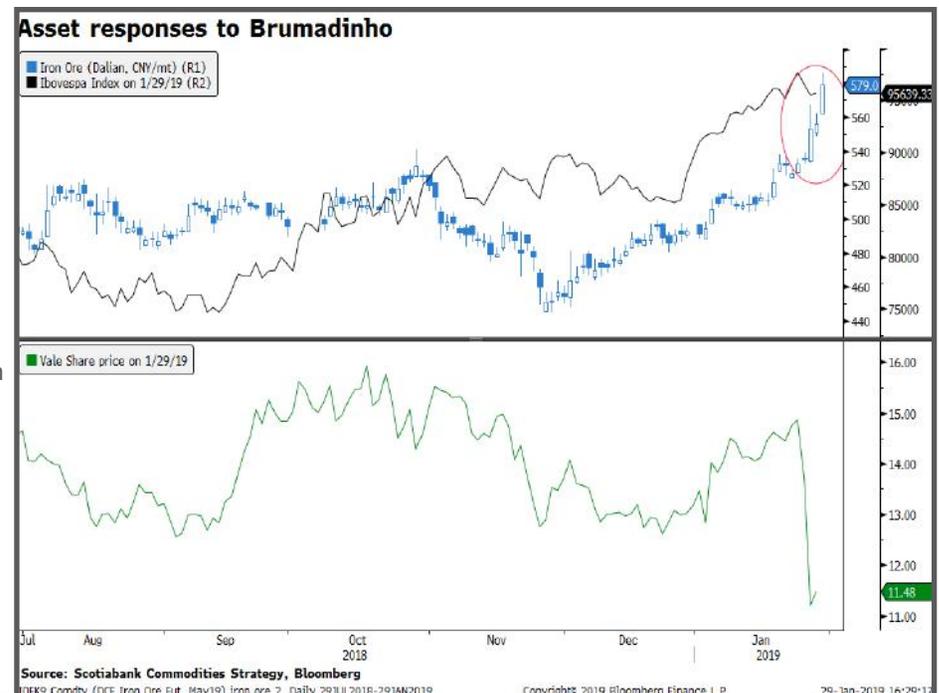
Those are the basic facts. The below is only a *first look* at the potential impact on mostly base/bulks metals from several perspectives; there will be lengthy investigation\*\* and its too early to quantify the economic, social & environmental impact, but here is a stab....

Page: Iron Ore

Page 2: Nickel, Copper, Alumina

\*There are parallels drawn to the Samarco tailings collapse since 1) it occurred only 100km away from the current site, 2) it was also an “upstream tailings dam” which is cheaper method (vs using rock & earth, since it involves simply banking up the tailings themselves.

\*\* the 2015 Samarco dam disaster was only settled on Jan 2019, and operations still haven't resumed



**First responders: Iron Ore**

- Vale is the largest Iron ore producer (~400Mt of production owning about 23% of the seaborne Iron Ore market,) but is dominant in the more niche market— pellets and high grade fines. Despite the accident taking place at the much smaller operation, Iron Ore\* spiked 6% in first day following the accident and is currently 8% up since then. Its basically repriced 20% higher since the commodities trough in December due to this disaster. That is a much larger response vs the similar spot IO index remaining largely unchanged after the Samarco disaster. The fact that there wasn't an active IO futures market back in 2015, probably explains away some of the muted response then, but also:
  - Iron Ore is up not because the metal in the dam would change S&D balances (this is a muddy sludge that's largely considered waste, despite still continuing some IO, and wouldn't be earmarked for supply or factored into balances). Its more about the operations halt (at Feijao) since Saturday and the fear of further halts and longer-term implications — legal proceedings & penalties, the review of the entire tailings system and potentially more stringent mining regulation in Brazil etc. This triggered an 'immediate' reaction in the Iron Ore paper/futures market (especially in China on Dalian exchange, less so on Comex).
  - Our Equity Metals & Mining analysts [full report](#) outlined that in reality, the Feijao mine only accounts for <2% of Vales 2019 production guidance and that they can ramp up production in other locations if they need to stick to the production targets. They also highlighted that if this accident delays the reopening of Samarco (they model a restart in 1H/20) the pellets market should remain tight and the pellet premium is likely to stay high for longer than currently envisioned...
- Longer-term:
  - The potential shake-up of international mining standards: Vale said it was inspecting and maintaining the dam in Brumadinho in accordance with best mining practices ("I'm not a mining technician. I followed the technicians' advice and you see what happened. It didn't work. We are 100% within all the standards, and that didn't do it," - CEO). The outcome of the investigation will be essential in deciphering if those international standards are stringent enough, as [The Economist](#) pointed out. There are 17 tailings dams in Vales Iron Ore portfolio; there are 3500 tailings dams around the world!
  - Thus, the cost of producing iron ore—basically the key raw materials ingredient for steel and the 2nd largest commodity by value, after crude—should increase, which has potential inflationary effects for the broader macro-economy. It simply is the raw input/ foundation of everything con-

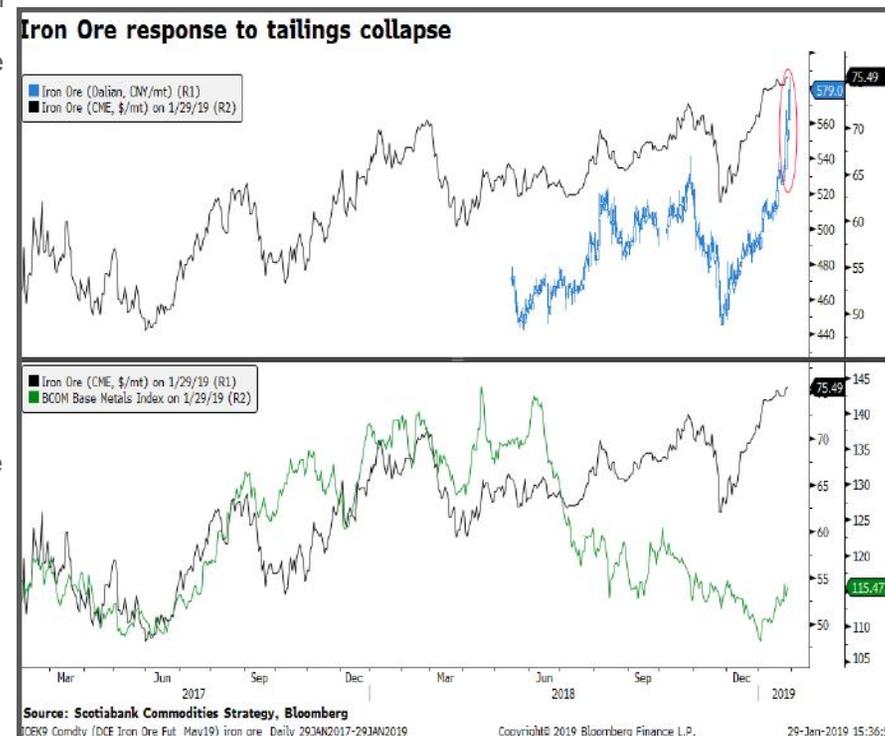
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## 2. Potential implications for base metals:

While its still very early and no company and official statements with regard to production has been made, Iron Ores quick response to the rather long-term implications, suggests we need to assess similar implications for other metals. Vale is not only the worlds largest Iron Ore, but also the largest Nickel producer (and a top 10 Copper producer). *Some* of these operations are not in Brazil (and thus don't fall under the same legal & regulatory "Iron ore review") but **the threat stems from their associated expansion plans and any expectation that these are either halted, delayed or changed as Fitch pointed out. One cannot assume the production losses will be contained within Iron Ore....**

- **Nickel:** Upside price risk. A top priority for the company has been committing to Nickel before EVs become a reality, given their expectation that an additional 500K mt of battery-grade Nickel is required by 2025\*. They have operations in Canada, Indonesia & New Caledonia, with a goal to ramp up Ni production from 244k mt (2019E) to 313k mt (short-term) and 400k mt (medium-term). These plans (together with new HPAL projects announced) injected a supply-fear overhang in the Nickel market in Q4'18 helping to take 3m prices from \$14K to below \$11K. **Thus, the current disaster—while it hasn't occurred at any large Nickel operations— poses a risk to future supply plans given the relative severity of the disaster (a far higher human cost than Samarca), the frequency (2 disasters in 3 years) and the potential associated wide-ranging implications on both a company and global mining level.**
- **Copper:** Unlike Nickel, there are some copper projects in Brazil, in the Carajas region which is meant to contribute ~180-190K mt\*\* of Copper in the medium term. Again, the outlook for supply is muddled by this disaster, in a market that is riding on low inventory levels and has less buffer room fundamentally as it shifts from broadly balanced to a deficit market in 2019
- **Alumina & Ali:** Indirectly, the dam disaster could complicate the **Alunorte restart**, earmarked for Q1. A Para state judge said on Sunday that "I believe this could complicate Hydro's return to operations a little bit. Now we need to do everything that is necessary as a precaution to make sure nothing worse happens." Despite Alunortes operation not being a dam, it's the thinking that political and regulatory focus shifts and a blanket defensive approach is taken.

\*Vales 2018 Investor day presentation: using NCM 811 battery chemistry, if EVs grow from 1.8m to 13.8m (change of 12m EV vehicles), at 43kg of Nickel, that's > 500K mt of additional high quality Nickel by 2025

\*\* Medium Term Copper projects in Carajas Region = Salobo III (~40k mt), Cristalino (~80k mt) and Alemao (60-70k mt). There are 9 projects for the longer-term.

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