



## Blue Nodules Deliverable 1.3 Business case data report



**Deliverable Report: Final, issue date on 31-01-2019**

<b>Deliverable No.</b>	Blue Nodules D1.3	
<b>Deliverable Title</b>	Business case activities and data collection	
<b>Deliverable Date</b>	2019-01-31	
<b>Deliverable Type</b>	REPORT	
<b>Dissemination level</b>	Confidential – member only (CO)	
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<b>Status</b>	FINAL	2019-01-31

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 688975. The information and views set out in this publication does not necessarily reflect the official opinion of the European Commission. Neither the European Union institutions and bodies nor any person acting on their behalf, may be held responsible for the use which may be made of the information contained therein.

## Publishable summary

Global population is growing quickly, with an estimated peak population of 9 billion by 2050. That's almost 30% increase over the next 30 years. Moreover, in the developing world, about 180.000 move from rural areas to cities every day. This rapid urbanization instigates a soaring mineral demand, because in the developed world, minerals are everywhere. They're in the buildings we live in, the cars we drive, the mobile phones we use, in batteries and flatscreens, and so on. Furthermore, the shift towards renewable, low-carbon energy infrastructure puts even more pressure on mineral supplies, as solar panels, wind turbines and batteries require significantly more minerals per kilowatt produced than conventional energy sources. With the Clarion Clipperton Zone holding more nickel, manganese and cobalt than all land-based reserves combined, deep sea mining opens up perspectives for the metals direly needed for the shift to a renewable economy. Nodules hold higher grades than typical terrestrial deposits. Their presence at the seabed surface eases exploration considerably (no need for drilling and/or bottom-penetrating exploration techniques), and allows for recovery without any overburden removal.

Nickel and cobalt will see a radical market change in the next decade. While now primarily used as an alloy element in steel, they are vital for the cathodes of Lithium-ion batteries, a surging market. High-purity manganese is equally important for the cathodes of NMC batteries, but the huge volumes of manganese used for steelmaking dampens the relative effect of the booming battery market on manganese demand. Copper is essential for any electrification purpose. Due to its widespread electricity-related use in static infrastructure however, the relative impact of the surge in electric vehicles will remain limited. As such, copper demand will grow, but it will not explode.