

#### **ENVIRONMENTAL IMPACTS OF BITCOIN**

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# OUTLINE

- Motivation
- Methodology
  - LCA
- Environmental, Social GovernanceAssessment
- Results and Implications
  - Carbon footprints of Bitcoin and gold production
  - Critical exchange rate
- Questions and Answers



### **Cryptocurrency market**



**Reference**: https://doi.org/10.1016/j.physrep.2020.10.005



#### Why did we choose to study Bitcoin?



**Reference**: https://bitrazzi.com/3-biggest-cryptocurrencies/



#### **Concerns about Bitcoin's environmental impact**

#### **The Graphic Truth**

#### Crypto-mining sucks up lots of power

Electricity usage (TWh, annualized)



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#### Then Elon Musk further stirred things up...



Tesla & Bitcoin

Bitcoin. We are concerned about rapidly increasing use of fossil fuels for Bitcoin mining and transactions, especially coal, which has the worst emissions of any fuel.

Cryptocurrency is a good idea on many levels and we believe it has a promising future, but this cannot come at great cost to the environment.

Tesla will not be selling any Bitcoin and we intend to use it for transactions as soon as mining transitions to more sustainable energy. We are also looking at other cryptocurrencies that use <1% of Bitcoin's energy/transaction.

1:06 AM · May 13, 2021

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#### Not everyone thinks Bitcoin is impactful



Reference: https://twitter.com/kuriharan/status/940239505914826752/photo/1



There is only one question really....

# What is the functional unit?



#### How would you compare these two?







#### What is a 'functional unit'?

- A functional unit is a quantified description of the function of a product that serves as the reference basis for all calculations regarding impact assessment.
- A function may be based on different features of the product under study, such as performance, aesthetics, technical quality, additional services, costs, etc.



#### So, what did we do then?

- There is only one function of digital currency: its purchasing value
- Thus, we compared the environmental impacts of Bitcoin and gold per unit value (\$) to see which one is more impactful.



#### Why not include printed currency?

#### When it comes to environmental impact,







#### LIFE CYCLE ASSESSMENT

- Life-cycle assessment or LCA (also known as lifecycle analysis) is a methodology for assessing environmental (and if desired, economic and social) impacts associated with all the stages of the life-cycle of a commercial product, process, or service.
- The following stages are usually taken into account:
  - Raw material acquisition
  - Production
  - Storage (if applicable)
  - Use (operation)
  - End-of-life-treatment



#### LIFE CYCLE ASSESSMENT





#### LIFE CYCLE ASSESSMENT

- We considered the following inputs:
  - Electronic components for Bitcoin mining
  - Electricity required for Bitcoin mining
  - Material and energy input for gold mining
  - Transportation of gold
- Four different locations were studied:
  - Turkey (where this paper was written)
  - Poland (relies heavily on coal)
  - Denmark (high share of renewables)
  - France (nuclear is by far the biggest energy source)



#### **RESULTS – Comparison of locations**

15,447 16000 14000 12000 10000 8,103 7,538 8000 6000 4000 1,728 2000 1,206 316 Bicoin nining in photomotoic panels Biscoin mining in PL BicoinninginIR BitcoinnininginFR Bitcoin mining in Dit Gold production



#### **RESULTS – Critical Exchange Rates**

value (\$) of Bitcoin so that gold and Bitcoin would have equal CF

3000000





- The huge rise in popularity of Bitcoin has shone a light on the cryptocurrency industry's environmental, social, and governance (ESG) performance
- The vast majority of the world's financial institutions manage climate risk and other ESG risks in their own portfolios. While the focus has primarily been on the ESG performance of cryptocurrency miners, the ESG performance of the broader cryptocurrency industry will increasingly need to be considered
- A recent survey of 600 people in the fund management industry found that 96% expected their firms to increase the prioritization of ESG this year. John Reed Stark, former chief of the U.S. Securities and Exchange Commission's Office of Internet Enforcement, thinks that the bitcoin ESG concern will certainly dampen institutional investment in crypto.

- Environmental:
- The Impact of the Paris Agreement
- Social: compliance safeguards, transparent and traceable
- Corporate Governance: transparency of a cryptocurrency market participant's governance framework

- The ESG agenda includes both investment risks and opportunities. EU, require financial institutions to look beyond climate risk to other environmental factors, in addition to social and governance concerns. And because many financial institutions view ESG performance as directly linked to financial performance, they elect to diligence such matters regardless of the regulatory frameworks they are subject to.
- Any cryptocurrency firm looking to access finance from financial institutions to need to holistically review its ESG credentials and narrative and consider how it would like to publicly present its performance against traditional ESG metric
- For ESG-conscious financial institutions looking to trade, invest, or custody digital assets, it will be critical to review the cryptocurrency firms' ESG credentials and narratives to ensure that they are in line with their own ESG objectives, as well as client expectations.



# DISCUSSION-

- Even if the entire energy for mining comes from photovoltaic panels, the value of a single Bitcoin should be around \$196,000 so that gold and Bitcoin would have equal carbon footprints.
- The highest ever price of Bitcoin was around \$60,000.
- Therefore,

BITCOIN IS INDEED ENVIRONMENTALLY HAZARDOUS



#### **DISCUSSION-ESG**

The ESG agenda includes both investment risks and opportunities The blockchain technology that underpins cryptocurrencies has a lot more promise at providing solutions to long-standing ESG problems.



#### How to improve this work?

- More locations could have been studied (lack of data)
- Quantifying the environmental impacts of gold mining only in terms of its carbon footprint might be interpreted as missing the big picture. The following impacts could have been taken into account:
  - land transformation as a result of deforestation due to mining activities
  - human toxicity potential due to the use of cyanide for leaching
  - photochemical smog formation due to the transportation of gold via internal combustion engine-powered means of transportation
- Review how to address concerns related to ESG





# THE END

Thank you for listening!

Any questions?