AMAART

Carbon footprint analysis of minting an ERC-721 NFT

INTRODUCTION

Living as an artist is extremely challenging and for many artists and their families the covid-19 pandemic was another setback.
Art was born with the pandemic digital built around the SNF which allowed to save financially many artists.

“Non-fungible” SNF tokens are special types of cryptographic tokens that represent a good or an asset and to operate they need to exploit the reference blockchain.

They can cover a wide range of unique tangible and intangible objects, by the SNF of digital art (ex: Beeple), to collectible cards, to virtual worlds (ex: Sandbox and Decentraland), until you get to digital sneakers.

SNF can be created, earned, traded, shared and harvested.

But behind this financial solution, there’s another story to tell:
SNF have a huge impact environment.
And to understand this impact environment, you need to understand how an SNF is created and sold.

Imagine an artist digitally creates and sells a work of art.
Scenario one, he prints that art, wraps it up and sends it to his client.
In **scenario two**, it sells it as NFT using a service based on Ethereum.

Let’s look at the carbon cost of each scenario, step by step.

OBJECTIVES

For secure sustainability, we should all work together to ask the CryptoArt/NFT platforms:

-A declaration of values.

-A commitment to transparency, and a guide to Crypto Artists.

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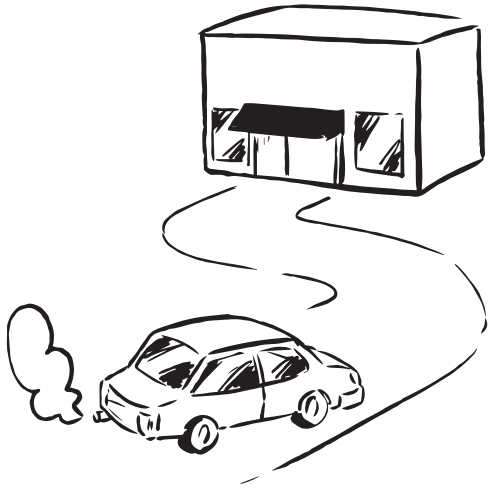

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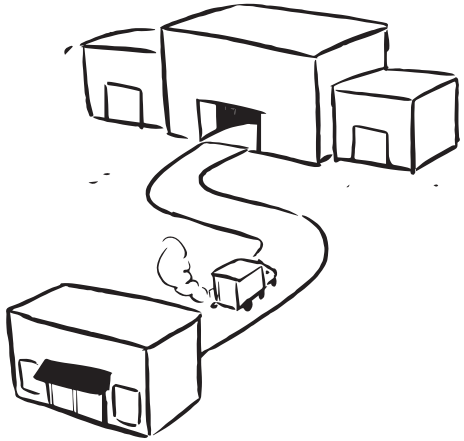

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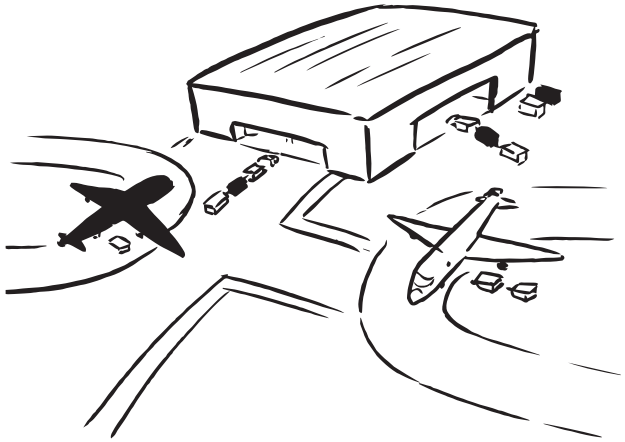

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2.3 KG OF CO2 FOR PRINT

1 A SALE AND A CLICK

An artist lists his artwork online and a client purchases it.

CARBON EMISSIONS:
0,028 Kg of CO2

2 PACKAGING OF WORK

The artist prints the work and wrapped it.

CARBON EMISSIONS:
0,13 kg of CO2

3 DRIVE TO THE STORE FOR SHIPPING

The artist drives to the nearest shipping shop, 2 km away.

CARBON EMISSIONS:
0,82 kg of CO2

4 THE FIRST SORTING

The store sends the package to the local hub 5 miles away, where it is sorted.

CARBON EMISSIONS:
0,08 kg of CO2

5 FLYING TO THE SORTING PLANT

From the hub, the package is sent to the airport, 10 km away, then, the package is taken – along with many others – to the main sorting center in Louisville, Kentucky, 660 miles away.

CARBON EMISSIONS:
0,176 kg of CO2

6 FLY TO THE CLIENT S CITY

The package is sorted and loaded onto another plane, and after that plane it flies to the nearest shipper's center, 1,800 miles away.

CARBON EMISSIONS:
0,27 kg of CO2

7 OUT FOR DELIVERY

From that facility, the package is sent to a local hub, 10 miles away, where it is sorted on a truck for delivery. Finally, the parcel reaches the customer's home.

CARBON EMISSIONS:
0,8 kg of CO2

TOTAL EMISSIONS:
2,304 kg of CO2. It's like driving nine miles in a U. S. gasoline car.

BLOCKCHAIN

A decentralized database.
It is important to know that there are many different blockchains (ex: Ethereum, Cardano, Algorand, Polkadot etc.), and usually each blockchain has its own currency.

CRYPTOCURRENCY

Bitcoin (BTC) is the best known cryptocurrency and the oldest.

NFT

Nft: non-fungible token.
A unique token associated with some media (ex: image, video, poetry, anything else) or any unique resource, such as a home, property, etc. that has its ID or file registered specifically on a block on the blockchain.

SMART CONTRACT

It consists of a program that lives and works on the blockchain.
Smart contracts are what creates and keeps track of ASA, SNF, Dapps etc.
Some of these types of contracts may be legally binding.

COINNING AN NFT

The act of “creating” an NFT, registering the token on the blockchain and associating it with your media.

NFT PLATFORM MARKETPLACE

A website that allows people to buy and sell SNF.
Ebay or Amazon, but who uses a blockchain in the background.

GAS TAX

A fee you have to pay
(usually paid by the vendor) in order to publish, on Ethereum.
This commission does not go to the platform, but to Ethereum to compensate for the computing power needed to process and validate transactions.
At present Ethereum gas tariffs are very high and fluctuate (ex: >$100-$1000) with grid congestion.

PORTFOLIO

Consists of a bank account on the blockchain, which contains your cryptocurrency. Different cryptocurrencies often require different wallets. Usually it’s a software, hardware or browser extension that gives you a private seed which is usually a bunch of random words, it’s like your password to your wallet, which you should keep safe and never share with anyone.

CONSENSUS ALGORITHM

Is the algorithm behind the blockchain.
There are a lot of consensus algorithms like Proof-of-Work (PoW) is the consensus algorithm that is hundreds of times more inefficient than the others.
Here are some other consensus algorithms:
Proof-of-Stake (PoS), Delegated Proof-of-Stake (DPoS), Proof-of-Authority (PoA), Byzantine Fault Tolerance (BFT), Delegated Byzantine Fault Tolerance (dBFT), etc.

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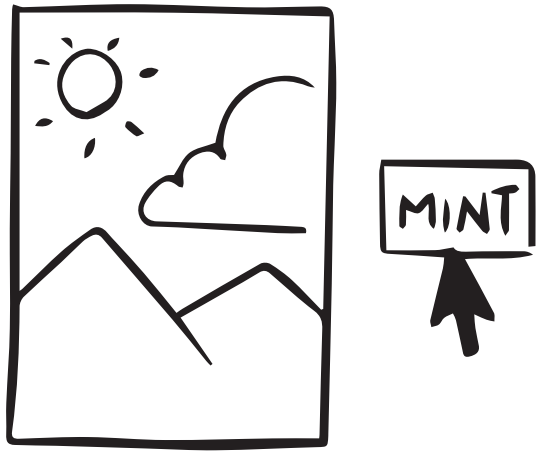

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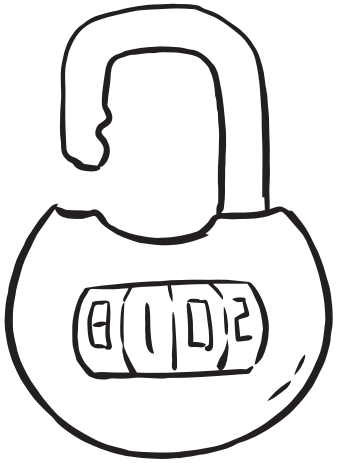

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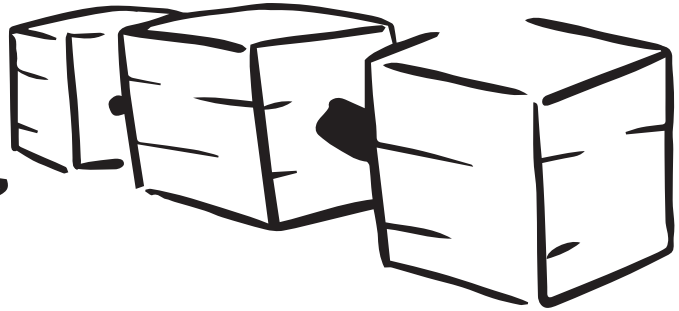

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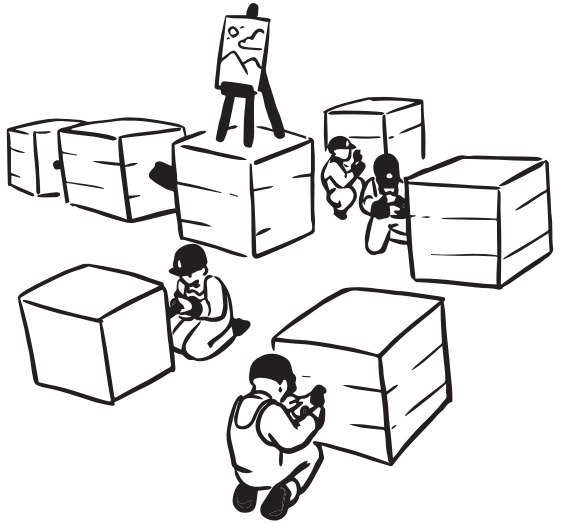

211 KG OF CO2 FOR NFT

1 UPLOADING THE WORK

The artist finds a website that will make it easier for him to create the NFT. Then upload your artwork, title it, and click a button to create it.

CARBON EMISSIONS:
Many of the phases in the minting of a nft have an unknown carbon footprint.

2 SUBMITTING IT TO MINERS

This mint transaction is then added to a list of unconfirmed cryptographic transactions. The list contains all incoming cryptographic activities, from simple buying and selling to more complex actions, such as entering the record of a digital artwork.

CARBON EMISSIONS:
Many of the phases in the minting of a nft have an unknown carbon footprint.

3 OPERATIONS

A miner selects a subset of transactions to lock together. Transactions are not added to the master register one by one.
The master ledger is known as blockchain because it consists of these blocks.

CARBON EMISSIONS:
Many of the phases in the minting of a nft have an unknown carbon footprint.

4 MINING FOR NUMBERS

To add this block to the blockchain, the miner must run against time to solve a cryptographic puzzle. Use a series of attempts and mistakes to quickly generate random numbers by checking each one to see if it is the solution. Top-of-the-line hardware can make hundreds of millions of assumptions per second. That's what makes crypto art so disrespectful of the environment. There's not just one miner trying to add this block to the blockchain. There are thousands of them, many of them are huge operations running huge computer networks in China, the Arctic, or elsewhere, trying to solve every puzzle.Then we have a winning miner. That is, which first produces a correct solution.

To calculate the carbon impact of adding this block to the blockchain, all the energy consumed by all miners is counted.

CARBON EMISSIONS:
83 kg of CO2.

5 THE BLOCK IS ADDED TO THE CHAIN

The miners check if the solution is correct.

CARBON EMISSIONS:
Many of the phases in the minting of a nft have an unknown carbon footprint.

6 THE MINER IS PAID

The winning miner is paid in cryptocurrency for their services.

CARBON EMISSIONS:
Many of the phases in the minting of a nft have an unknown carbon footprint.

7 THE NFT IS MINTED

The artwork now exists as an NFT, ready to be sold to a client, but the cycle continues, in fact every transaction following this NFT follows the same sequence of events.

CARBON EMISSIONS:
Every bid creates 23 kg of CO2
Every sale, 51 kg of CO2
Every transfer, 30 kg of CO2

TOTAL EMISSIONS:
Each must be added to a block, and the puzzle must be solved and verified. Over its lifecycle, the average NFT will accrue a stunning footprint of 211kg of CO2.

Rarely in today's world are regular consumers given such a significant environmental choice. Most people drive cars, eat meat and wear mass-produced clothes because there are no easy alternatives.

But there is still time to prevent this from becoming the normal way to support artists.

There are several ways this could work.The easiest way would be to not participate in buying or selling crypto art, and instead continue to support artists with traditional channels.

Another would be to choose better crypto art platforms. The method described above is called Proof of Work. A miner must prove that he has done a computational job before he can add a block to a blockchain. Proof of Work has been intentionally designed to be inefficient to make adding fraudulent transactions unprofitable for malicious actors, and is the underlying method of most popular NFT minting websites.

A leading alternative is known as Proof of Stake. In a Proof of Stake system, users are randomly assigned the ability to add new blocks based on how much cryptocurrency they have, not how much computational work they can do. The more a user is invested in the currency, the more likely it is to be the "Winner" who is paid to add a new block to the chain.

Proof of Stake 99% more energy efficient than Proof of Work.
This would lower the carbon footprint of the average NFT to about 211 kg CO2, or roughly the same as shipping a physical work of art.

LIST OF MORE ENVIRONMENTALLY FRIENDLY PLATFORMS

KODADOT - open marketplace for all kinds of digital collectibles
https://kodadot.xyz/
Blockchain: Kusama/Polkadot
implemented RMRK.app standard
Open application (not invite only or curated)

HIC ET NUNC - open marketplace for digital art
https://www.hicetnunc.xyz/
Blockchain: Tezos (XTZ)
https://twitter.com/hicetnunc2000

KALAMINT - curated marketplace for digital art
https://kalamint.io/
Blockchain: Tezos (XTZ)

SIGN ART - curated marketplace for digital art
https://sign-art.app/
Blockchain: Waves Protocol (WAVES)
Open application (with a curated option)

PIXEOS - open marketplace for digital art
https://pixeos.io/
Blockchain: EOS

EPORIO - open marketplace for digital art
https://epor.io/
Blockchain: xDai

LOVADA - inclusive marketplace for digital art
https://twitter.com/lovadaart
Blockchain: Cardano (ADA)

STELLAR NFT
https://stellarnft.com/
Blockchain: Stellar (XLM)

IMMUTABLE X
https://www.immutable.com/
Blockchain: Ethereum
Zero gas fees, instant trades and scalability, without compromise.