Lab - Analyzing Netflix's Carbon Footprint

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Let us work with Netflix's 2022 ESG report, available here: https://s22.q4cdn.com/959853165/files/doc_downloads/2023/06/29/Netflix_2022-ESG-Report-FINAL.pdf

1 Netflix CO_2 footprint and GHG report

1. As stated in slide 10, Netflix "aligned to the Science Based Targets Initiative (SBTi) standard". What is SBTi and what does this mean to be "aligned" here?
2. What are the CO_2e emissions of the 3 key Netflix activities?
3. When reading the GHG per scope emissions in slide 16, what is the difference between market-based and location-based scope 2 emissions? Use https://ghgprotocol.org/sites/default/files/ghgp/standards/Scope%202%20Guidance_Final_0.pdf
4. Make a simple distribution diagram of the video streaming service by showing AWS data centers, OpenConnect servers, the ISP networks and the end user device using https://openconnect.netflix.com/Open-Connect-Overview.pdf and slide 26.
5. When looking at the GHG breakdown per scope on slide 16, where do you expect to find the OpenConnect and AWS emissions (production and usage)?
6. Netflix has a large catalog of series, movies, documentaries. What types of servers (their function) do you expect to find at AWS data centers?
7. What liability limit does Netflix give itself on its CO_2 emission, for its streaming activity? Use slide n°27.
8. What are the estimated emissions breakdown (in %) for the 3 tiers (data center, network and user device)?
9. One can read on slide 26:
   `This trend is consistent with research findings, which show that the energy intensity of global data centers has decreased by 20% annually since 2010. This is a notable improvement compared with recent annual efficiency gains in other major demand sectors (e.g., aviation and industry), which are an order of magnitude lower .`
   How can we reconcile the former paragraph with the IEA estimate of the world-wide data center energy consumption in Figure 1?

2 The carbon footprint of one hour of streaming

Transparency No. 27, we learn that Netflix estimates its carbon footprint at 55g of CO_2.

1. Which geographical basis is taken to make this calculation of 55g?

Global trends in digital and energy indicators, 2015-2022

	2015	2022	Change
Internet users	3 billion	5.3 billion	+78%
Internet traffic	0.6 ZB	4.4 ZB	+600%
Data centre workloads	180 million	800 million	+340%
Data centre energy use (excluding crypto)	200 TWh	240-340 TWh	+20-70%
Crypto mining energy use	4 TWh	100-150 TWh	+2300-3500%
Data transmission network energy use	220 TWh	260-360 TWh	+18-64%

Sources: Internet users [ITU (2023)]; internet traffic [IEA analysis based on Cisco (2015); TeleGeography (2022); Telegeography (2023); Cisco (2019), Cisco Visual Networking Index]; data centre workloads [Cisco (2018), Cisco Global Cloud Index]; data centre energy use [IEA analysis based on Malmodin & Lundén (2018); ITU (2020); Masanet et al. (2020); Malmodin (2020); Hintemann & Hinterholzer (2022); Malmodin et al. (2023)]; cryptocurrency mining energy use [IEA analysis based on Cambridge Centre for Alternative Finance (2023); Gallersdörfer, Klaaßen and Stoll (2020); McDonald (2022)]; data transmission network energy use [Malmodin & Lundén (2018); Malmodin (2020); ITU (2020); Coroama (2021); GSMA (2022); GSMA (2023); Malmodin et al. (2023)].

Figure 1: IAE estimate of Data center consumption

2. What is the base year for the carbon intensity of electricity?
3. Get a global (world average) CO_2 emission based on carbon intensity data obtained from https://ourworldindata.org/ (Keyword : carbon intensity).

3 Netflix's Global Carbon Footprint

Browse https://about.netflix.com/en/news/what-we-watched-a-netflix-engagement-report and the associated excel file to answer the questions below https://assets.ctfassets.net/4cd45et68cgf/1HyknFM84ISQpeua6TjM7A/97a0a393098937a8f29c9d29c48dbfa8/What_We_Watched_A_Netflix_Engagement_Report_2023Jan-Jun.xlsx

1. How many Q_{clients} customers does Netflix have worldwide? This figure is provided in the ESG report, at the beginning.
2. How many hours of weekly streaming do they consume? $C_{\text{week\_per\_client}}$?
3. What is the annual amount of hours consumed Q_{year} ?
4. How many years of streaming $Q_{\text{year\_per\_mn}}$ are consumed per minute on the Internet by Netflix customers each year?
5. Compare with https://www.blogdumoderateur.com/infographie-une-minute-internet-2023/ on Figure 2. Which fraction does Netflix (approximately) represent?
6. To how many "average" human beings' CO_2 emissions correspond Q_{year} (expressed in grams of CO_2), taking into account in the calculation of global CO_2 emissions fossil fuels and land use changes on https://ourworldindata.org/.

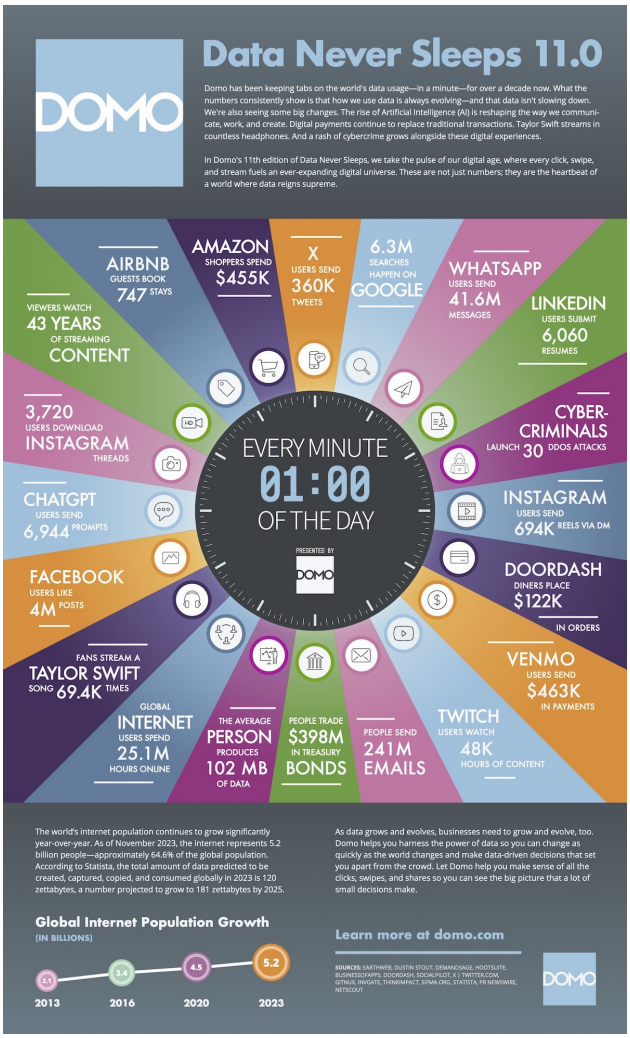

Figure 2: On minute in the life of Internet

4 A controversial subject?

Comparing this Netflix post https://about.netflix.com/en/news/the-true-climate-impact-of-streaming and page 14 of the state of the art estimates of an hour of streaming in the CarbonTrust report:

1. What reference does Netflix take as a previous estimate?
2. What advice does Netflix give to its customers?
3. Find arguments for or against taking into account the user terminal (your equipment)