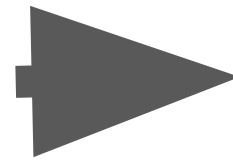




End-to-End GHG Emissions from Online Services

Hanan Awwad (MAsc Applied Science) and Ted Scott (PhD Geography)
Mentors: Mohammad Shahradsad and Ivan Beschastnikh

The Carbon Emissions of Online Services are not well known or trusted



We built a tool "Firefly" to measure the energy usage of the software that enables such services

Solutions Scholars Library

The Solutions Scholars program was established in 2023 to encourage interdisciplinary research in the areas of climate change mitigation, adaptation and education and to connect researchers across UBC's campuses.

The program supports graduate students to spend part of the academic year working on a solutions-oriented research project and receiving mentorship in interdisciplinary research and knowledge exchange.

This library includes some of the various deliverables produced by the Solutions Scholars throughout their term. In many cases, Scholars have journal articles in production which will be added to this library once published.

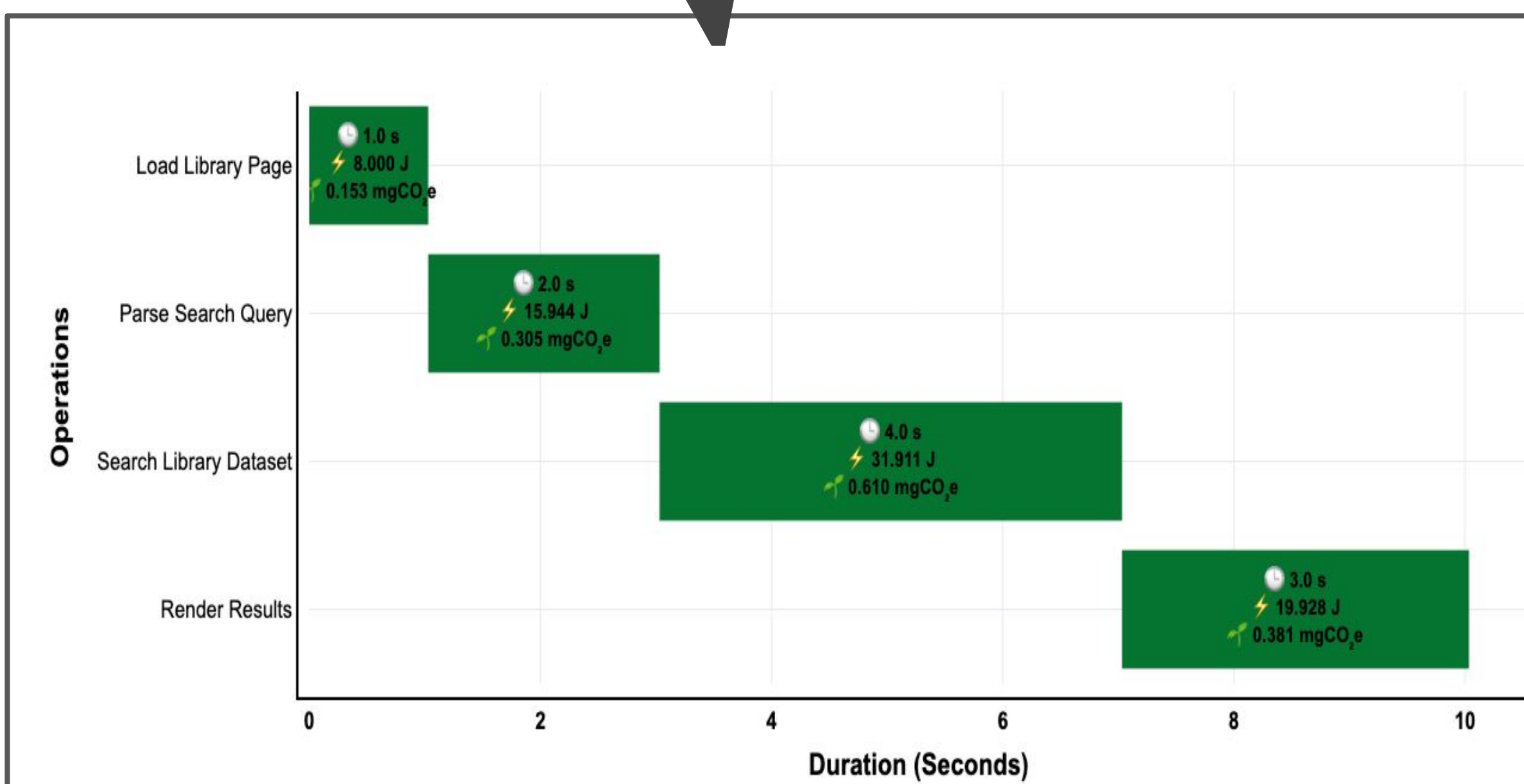
Search title or description: carbon offset

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Title	Solutions Scholars Authors	Co-author(s)	Supervisor(s)	Publication Year	Description
Carbon Offsets: A Just Path Toward Climate Action or Sustainability Illusion?	Isabella Morgante, Lucy Binfield, Peter McCartney		Hisham Zerriffi (Forestry), Kathryn Harrison (Political Science), Werner Antweiler (Sauder School of Business), Gregory Paradis (Forestry)	2025	Conference Presentation
Carbon Offsets: Climate Action or Sustainability Illusion?	Lucy Binfield, Isabella Morgante, Peter McCartney		Hisham Zerriffi (Forestry), Kathryn Harrison (Political Science), Werner Antweiler (Sauder School of Business), Gregory Paradis (Forestry)	2025	Poster
Canada's Carbon Offset Projects Probably Don't Offset Carbon. What Could Replace Them?	Lucy Binfield, Isabella Morgante	Hisham Zerriffi (Forestry)	Hisham Zerriffi (Forestry), Kathryn Harrison (Political Science), Werner Antweiler (Sauder School of Business), Gregory Paradis (Forestry)	2025	Opinion Piece

An example of using an online service

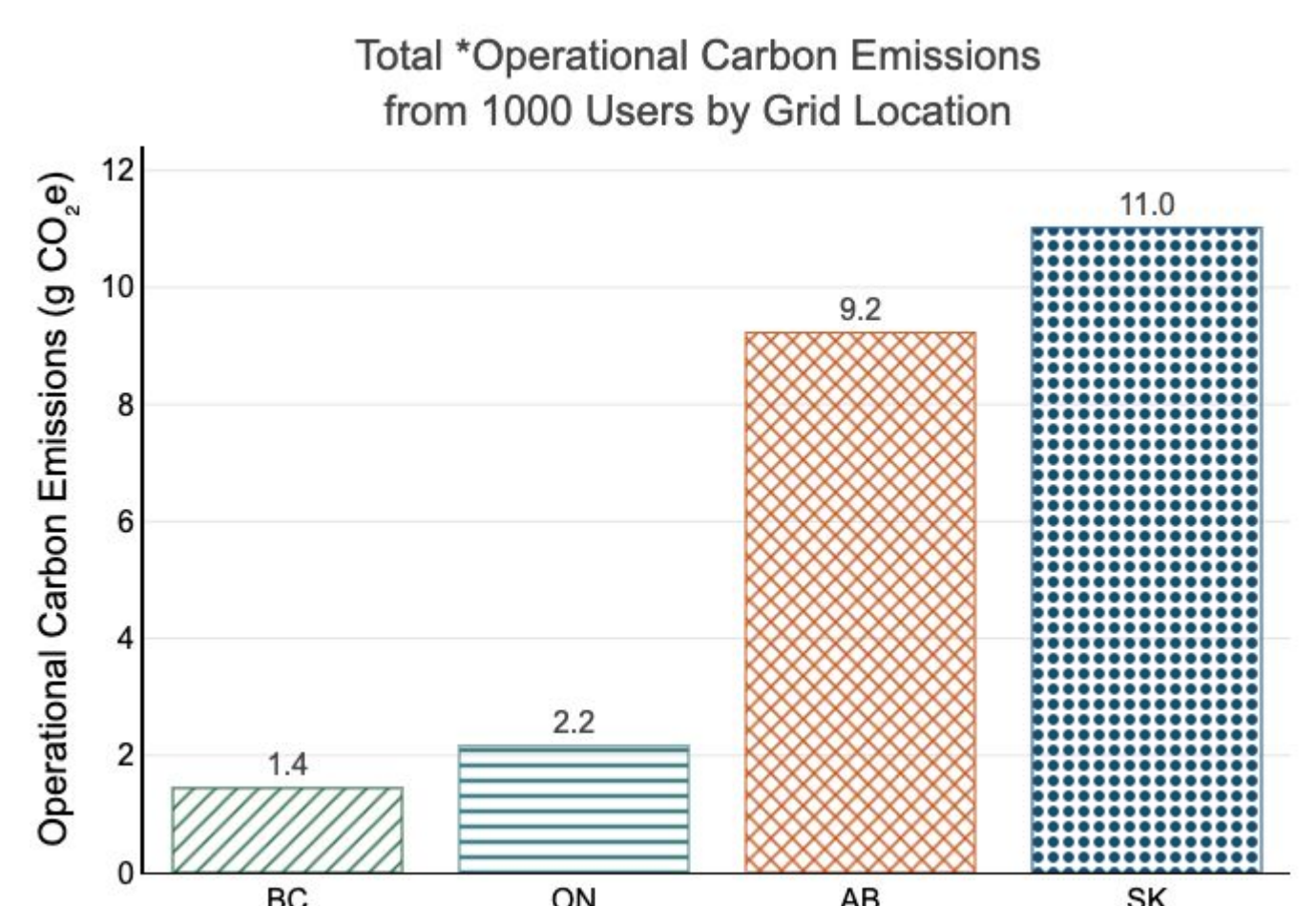
1. Load a webpage
2. Filter a list to find what you're seeking



Behind the scenes - services run to load the filtered list. In this case there are four components.

Firefly initiates measurements whenever a service runs and calculates the energy for each component. Here the full scenario used 91.3 J of energy.

Combined with the carbon intensity of the energy sources involved, a full accounting* of the carbon emissions from an online service is now possible



*Excluding embodied carbon

*Average grid carbon intensity using electricitymaps.com data, multiplied by 1.11(PUE)