What if we actually cared about climate change?

A proposal for constructive changes

Chris Mutel, 14.09.2021

The views expressed here are solely my own!

So… what if we really cared?

- If we recognised a moral imperative to reduce climate change…
- And we see our skills and limitations…
- Then what can we do as a community?

So… what if we really cared?

- If we recognised a moral imperative to reduce climate change…
- And we see our skills and limitations…
- Then what can we do as a community?
- LCA can help, but **only** if we…
  - Make sure our answers are correct
  - Make sure our answers are robust
  - Work effectively together beyond our habits and short-term self-interests

The right numbers

Confirmation of CO_2 totals

Compare with Global Carbon Budget 2019

Earth Syst. Sci. Data, 12, 3269–3340, 2020
https://doi.org/10.5194/essd-12-3269-2020

Open Access Earth System Science Data

https://essd.copernicus.org/articles/12/3269/2020/essd-12-3269-2020.html

Global Carbon Budget 2020

Pierre Friedlingstein[1,2], Michael O'Sullivan[2], Matthew W. Jones[3], Robbie M. Andrew[4], Judith Hauck[5], Are Olsen[6,7], Glen P. Peters[4], Wouter Peters[8,9], Julia Pongratz[10,11], Stephen Sitch[12], Corinne Le Quéré[3], Josep G. Canadell[13], Philippe Ciais[14], Robert B. Jackson[15], Simone Alin[16], Luiz E. O. C. Aragão[17,12], Almut Arneth[18], Vivek Arora[19], Nicholas R. Bates[20,21], Meike Becker[6,7], Alice Benoit-Cattin[22], Henry C. Bittig[23], Laurent Bopp[24], Selma Bultan[10], Naveen Chandra[25,26], Frédéric Chevallier[14], Louise P. Chini[27], Wiley Evans[28], Liesbeth Florentie[8], Piers M. Forster[29], Thomas Gasser[30], Marion Gehlen[14], Dennis Gilfillan[31], Thanos Gkritzalis[32], Luke Gregor[33], Nicolas Gruber[33], Ian Harris[34], Kerstin Hartung[10,a], Vanessa Haverd[13], Richard A. Houghton[35], Tatiana Ilyina[11], Atul K. Jain[36], Emilie Joetzjer[37], Koji Kadono[38], Etsushi Kato[39], Vassilis Kitidis[40], Jan Ivar Korsbakken[4], Peter Landschützer[11], Nathalie Lefèvre[41], Andrew Lenton[42], Sebastian Lienert[43], Zhu Liu[44], Danica Lombardozzi[45], Gregg Marland[31,46], Nicolas Metzl[41], David R. Munro[47,48], Julia E. M. S. Nabel[11], Shin-Ichiro Nakaoka[26], Yosuke Niwa[26,49], Kevin O'Brien[50,16], Tsuneo Ono[51], Paul I. Palmer[52,53], Denis Pierrot[54], Benjamin Poulter[55], Laure Resplandy[56], Eddy Robertson[57], Christian Rödenbeck[58], Jörg Schwinger[59,7], Roland Séférian[37], Ingunn Skjelvan[59,7], Adam J. P. Smith[3], Adrienne J. Sutton[16], Toste Tanhua[60], Pieter P. Tans[61], Hanqin Tian[62], Bronte Tilbrook[42,63], Guido van der Werf[64], Nicolas Vuichard[14], Anthony P. Walker[65],

Confirmation of CO_2 totals

Compare with Global Carbon Budget 2019

Observation: 9946

Million tons Carbon

ecoinvent 3.7.1 cutoff

Confirmation of CO_2 totals

Compare with Global Carbon Budget 2019

Observation: 9946 Million tons Carbon

Model: 582057 ecoinvent 3.7.1 cutoff

Confirmation of CO_2 totals

Observation: 9946

MMTC	Activity
85935	‘heat production, natural gas, at boiler fan burner low-NOx non-modulating <100kW’ (megajoule, RoW)
84386	‘heat production, natural gas, at boiler atmospheric low-NOx non-modulating <100kW' (megajoule, RoW)
82064	‘heat production, natural gas, at boiler atmospheric non-modulating <100kW' (megajoule, RoW)
82064	‘heat production, natural gas, at boiler fan burner non-modulating <100kW' (megajoule, RoW)
80515	heat production, natural gas, at boiler modulating <100kW' (megajoule, RoW)
77432	‘heat production, natural gas, at boiler atm. low-NOx condensing non-modulating <100kW' (megajoule, RoW)
75869	heat production, natural gas, at boiler condensing modulating <100kW' (megajoule, RoW)
3392	heat production, at hard coal industrial furnace 1-10MW' (megajoule, RoW)
2088	heat production, anthracite, at stove 5-15kW' (megajoule, RoW)
334	‘clinker production' (kilogram, RoW)

Confirmation of CO_2 totals

Observation: 9946

Corrected model: 8307

MMTC	Activity
0	heat production, natural gas, at boiler fan burner low-NOx non-modulating <100kW’ (megajoule, RoW)
0	heat production, natural gas, at boiler atmospheric low-NOx non-modulating <100kW' (megajoule, RoW)
0	‘heat production, natural gas, at boiler atmospheric non-modulating <100kW' (megajoule, RoW)
0	‘heat production, natural gas, at boiler fan burner non-modulating <100kW' (megajoule, RoW)
0	heat production, natural gas, at boiler modulating <100kW' (megajoule, RoW)
0	‘heat production, natural gas, at boiler atm. low-NOx condensing non-modulating <100kW' (megajoule, RoW)
0	heat production, natural gas, at boiler condensing modulating <100kW' (megajoule, RoW)
0	heat production, at hard coal industrial furnace 1-10MW' (megajoule, RoW)
0	heat production, anthracite, at stove 5-15kW' (megajoule, RoW)
334	‘clinker production' (kilogram, RoW)

Confirmation of CO_2 totals - Concrete

Compare with Global Carbon Budget 2019

Observation: 427

Million tons Carbon

ecoinvent 3.7.1 cutoff

Confirmation of CO_2 totals - Concrete

Compare with Global Carbon Budget 2019

Observation: 427 Million tons Carbon

Model: 456 ecoinvent 3.7.1 cutoff

Confirmation of CO_2 totals - Concrete

Compare with Global Carbon Budget 2019

Calcination emissions

Observation: 427 Million tons Carbon

Model: 456 ecoinvent 3.7.1 cutoff

Combustion & calcination emissions

Global cement production

Statistics*: 3191

- China (2015): 2350
- China (2019): 2300

Million tons Cement

Model: 2029

ecoinvent 3.7.1 cutoff

* https://www.statista.com/statistics/267364/world-cement-production-by-country/

Confirmation of CH_4 totals

Compare with Global Methane Budget 2017

Earth Syst. Sci. Data, 12, 1561–1623, 2020
https://doi.org/10.5194/essd-12-1561-2020

Open Access Earth System Science Data

The Global Methane Budget 2000–2017

Marielle Saunois[1], Ann R. Stavert[2], Ben Poulter[3], Philippe Bousquet[1], Josep G. Canadell[2], Robert B. Jackson[4], Peter A. Raymond[5], Edward J. Dlugokencky[6], Sander Houweling[7,8], Prabir K. Patra[9,10], Philippe Ciais[1], Vivek K. Arora[11], David Bastviken[12], Peter Bergamaschi[13], Donald R. Blake[14], Gordon Brailsford[15], Lori Bruhwiler[6], Kimberly M. Carlson[16,17], Mark Carrol[70], Simona Castaldi[18,19,20], Naveen Chandra[9], Cyril Crevoisier[21], Patrick M. Crill[22], Kristofer Covey[23], Charles L. Curry[24,71], Giuseppe Etiope[25,26], Christian Frankenberg[27,28], Nicola Gedney[29], Michaela I. Hegglin[30], Lena Höglund-Isaksson[31], Gustaf Hugelius[32], Misa Ishizawa[33], Akihiko Ito[33], Greet Janssens-Maenhout[13], Katherine M. Jensen[34], Fortunat Joos[35], Thomas Kleinen[36], Paul B. Krummel[37], Ray L. Langenfelds[37], Goulven G. Laruelle[38], Licheng Liu[39], Toshinobu Machida[33], Shamil Maksyutov[33], Kyle C. McDonald[34], Joe McNorton[40], Paul A. Miller[41], Joe R. Melton[42], Isamu Morino[33], Jurek Müller[35], Fabiola Murguia-Flores[43], Vaishali Naik[44], Yosuke Niwa[33,45], Sergio Noce[20], Simon O'Doherty[46], Robert J. Parker[47], Changhui Peng[48], Shushi Peng[49], Glen P. Peters[50], Catherine Prigent[51], Ronald Prinn[52], Michel Ramonet[1], Pierre Regnier[38], William J. Riley[53], Judith A. Rosentreter[54], Arjo Segers[55], Isobel J. Simpson[14], Hao Shi[56], Steven J. Smith[57,58], L. Paul Steele[37], Brett F. Thornton[22], Hanqin Tian[56], Yasunori Tohjima[72], Francesco N. Tubiello[59], Aki Tsuruta[60], Nicolas Viovy[1], Apostolos Voulgarakis[61,62], Thomas S. Weber[63], Mi[illegible] https://essd.copernicus.org/articles/12/1561/2020/essd-12-1561-2020.html [illegible]ch[67], Yi Yin[1,27], Yukio Yoshida[33], Wenxin Zhang[71], Zhen Zhang[68], Yuanhong Zhao[1], Bo Zheng[1], Qing Zhu[53],

Confirmation of CH_4 totals

Compare with Global Methane Budget 2017

Observation: 332-406 Million tons CH_4

Model: 209 ecoinvent 3.7.1 cutoff

Conclusion: **Confirmation** is a core aspect of database management, and a driver for how databases plan new data acquisition

Robust numbers

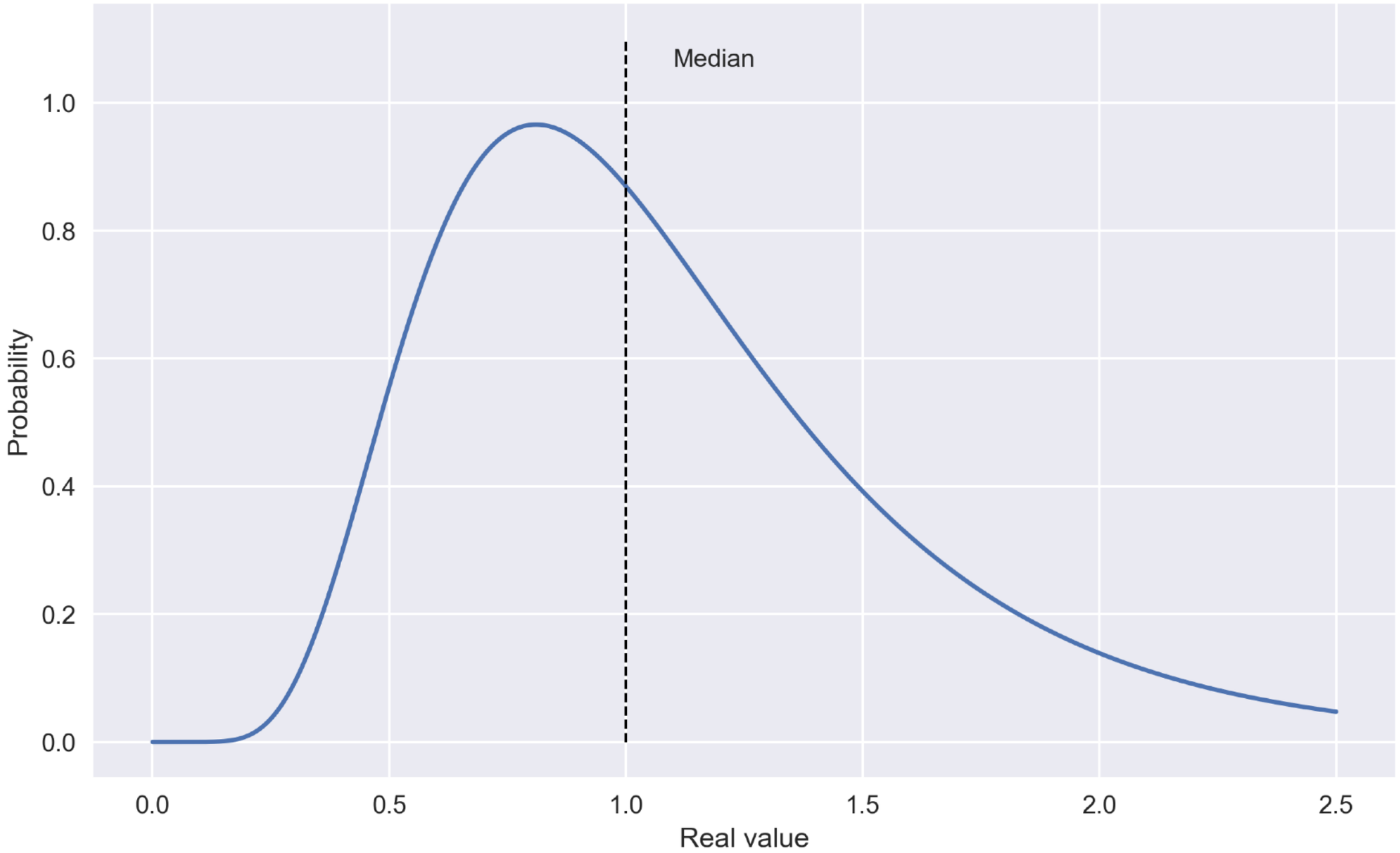
Sensitivity analysis of Swiss consumption

Results from Aleksandra Kim (PhD student, PSI)
ecoinvent 3.7.1 cutoff & agribalyse

1. petrol, unleaded → petrol production, low-sulfur (EUR w/o CH)
2. electricity, high voltage → electricity voltage transformation from high to medium voltage (CH)
3. electricity, medium voltage → electricity voltage transformation from medium to low voltage (CH)
4. integrated circuit, logic type → printed wiring board production, surface mounted… (GLO)
5. electricity, high voltage → electricity voltage transformation from high to medium voltage (CN-SGCC)
6. gold → integrated circuit production, logic type (GLO)
7. wafer, fabricated, for integrated circuit → integrated circuit production, logic type (GLO)
8. diesel, burned in diesel-electric generating set, 10MW → onshore well production, oil/gas (GLO)
9. electricity, medium voltage → integrated circuit production, logic type (GLO)
10. liquid crystal display, unmounted → display production, liquid crystal, 17 inches (GLO)
11. soybean → soybean, feed production (RoW)
12. cow milk → cheese production, soft, from cow milk (GLO)
13. integrated circuit, logic type → printed wiring board production, surface mounted… (GLO)
14. glider, passenger car → passenger car production, petrol/natural gas (GLO)
15. reinforcing steel → glider production, passenger car (GLO)
16. pig iron → steel production, converter, unalloyed (RoW)
17. light fuel oil → heat production, light fuel oil, at boiler 10kW, non-modulating (CH)
18. light fuel oil → heat production, light fuel oil, at boiler 10kW condensing, non-modulating (CH)
19. printed wiring board, surface mounted… → computer production, laptop (GLO)

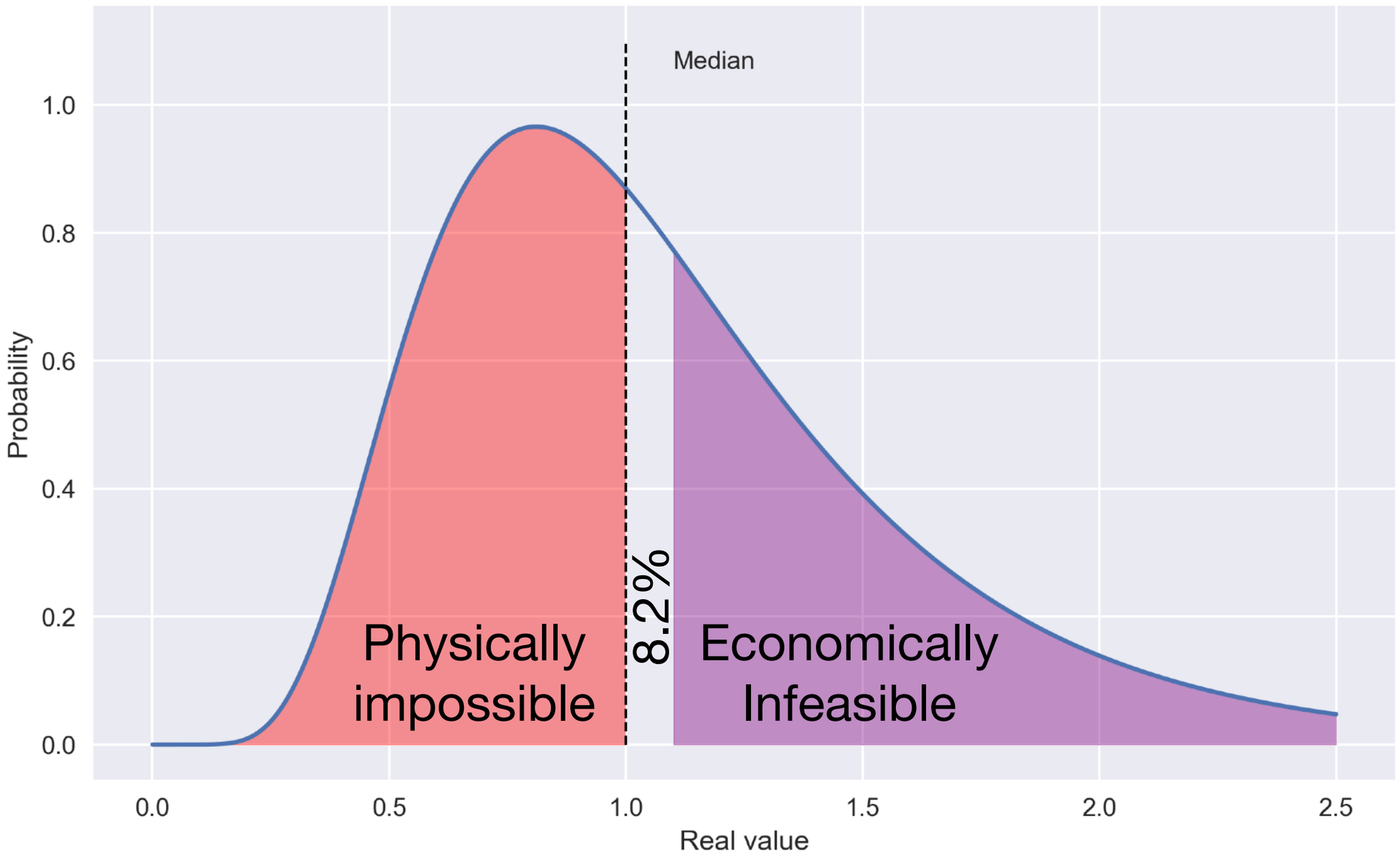
Sensitivity analysis of Swiss consumption

1.petrol, unleaded → petrol production, low-sulfur (EUR w/o CH)



Sensitivity analysis of Swiss consumption

1.petrol, unleaded → petrol production, low-sulfur (EUR w/o CH)



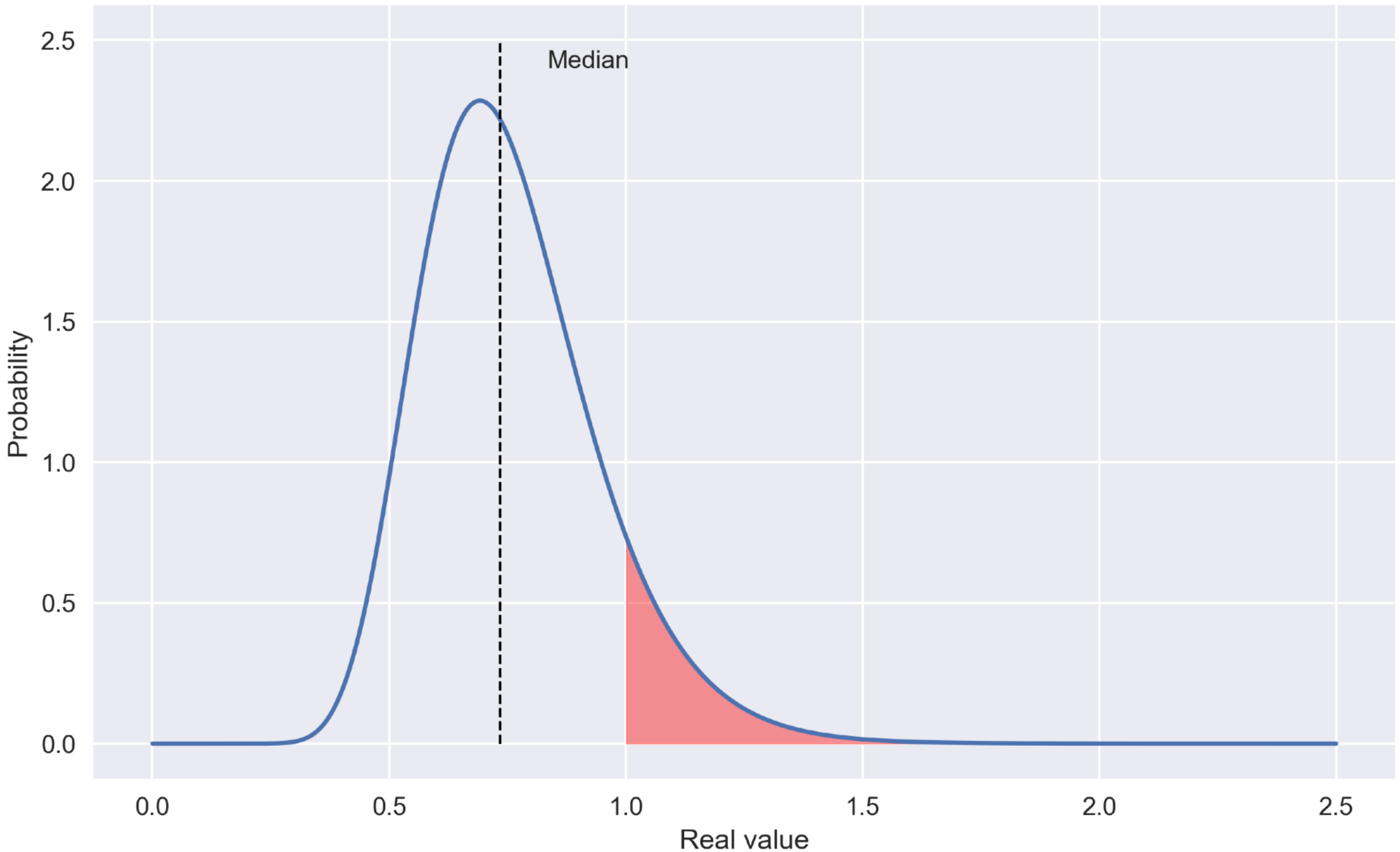
Sensitivity analysis of Swiss consumption

Results from Aleksandra Kim (PhD student, PSI)
ecoinvent 3.7.1 cutoff & agribalyse

1. petrol, unleaded → petrol production, low-sulfur (EUR w/o CH)
2. electricity, high voltage → electricity voltage transformation from high to medium voltage (CH)
3. electricity, medium voltage → electricity voltage transformation from medium to low voltage (CH)
4. integrated circuit, logic type → printed wiring board production, surface mounted… (GLO)
5. electricity, high voltage → electricity voltage transformation from high to medium voltage (CN-SGCC)
6. gold → integrated circuit production, logic type (GLO)
7. wafer, fabricated, for integrated circuit → integrated circuit production, logic type (GLO)
8. diesel, burned in diesel-electric generating set, 10MW → onshore well production, oil/gas (GLO)
9. electricity, medium voltage → integrated circuit production, logic type (GLO)
10. liquid crystal display, unmounted → display production, liquid crystal, 17 inches (GLO)
11. soybean → soybean, feed production (RoW)
12. cow milk → cheese production, soft, from cow milk (GLO)
13. integrated circuit, logic type → printed wiring board production, surface mounted… (GLO)
14. glider, passenger car → passenger car production, petrol/natural gas (GLO)
15. reinforcing steel → glider production, passenger car (GLO)
16. pig iron → steel production, converter, unalloyed (RoW)
17. light fuel oil → heat production, light fuel oil, at boiler 10kW, non-modulating (CH)
18. light fuel oil → heat production, light fuel oil, at boiler 10kW condensing, non-modulating (CH)
19. printed wiring board, surface mounted… → computer production, laptop (GLO)

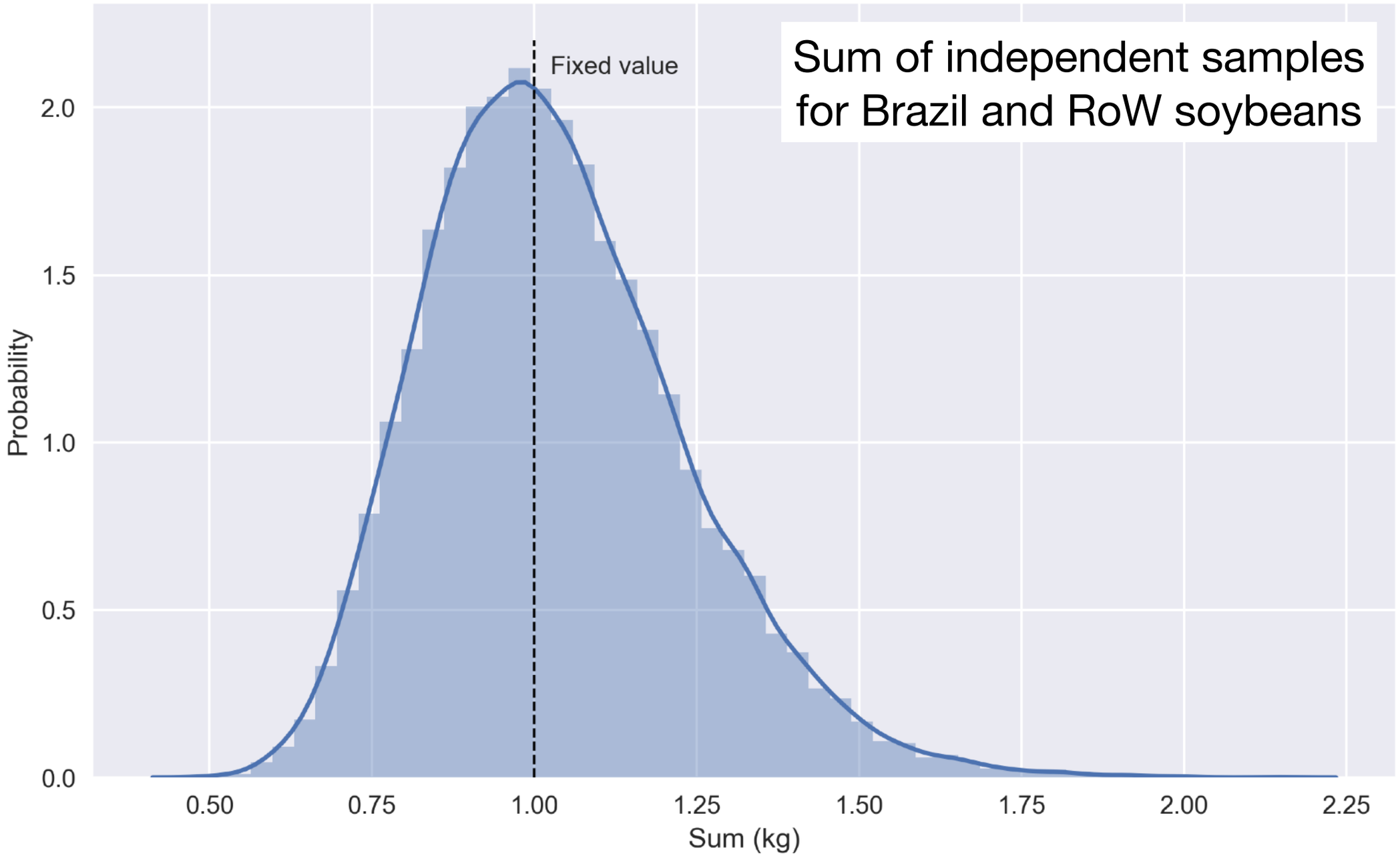
Sensitivity analysis of Swiss consumption

11. soybean (RoW) → soybean, feed production (RoW)



Sensitivity analysis of Swiss consumption

11. soybean (RoW) → soybean, feed production (RoW)



Conclusions:

1. **Default values for uncertainty should not be allowed.**
2. **Physical limits** can be applied automatically, economic limits manually.
3. **Virtual markets** need fixes in data and software.

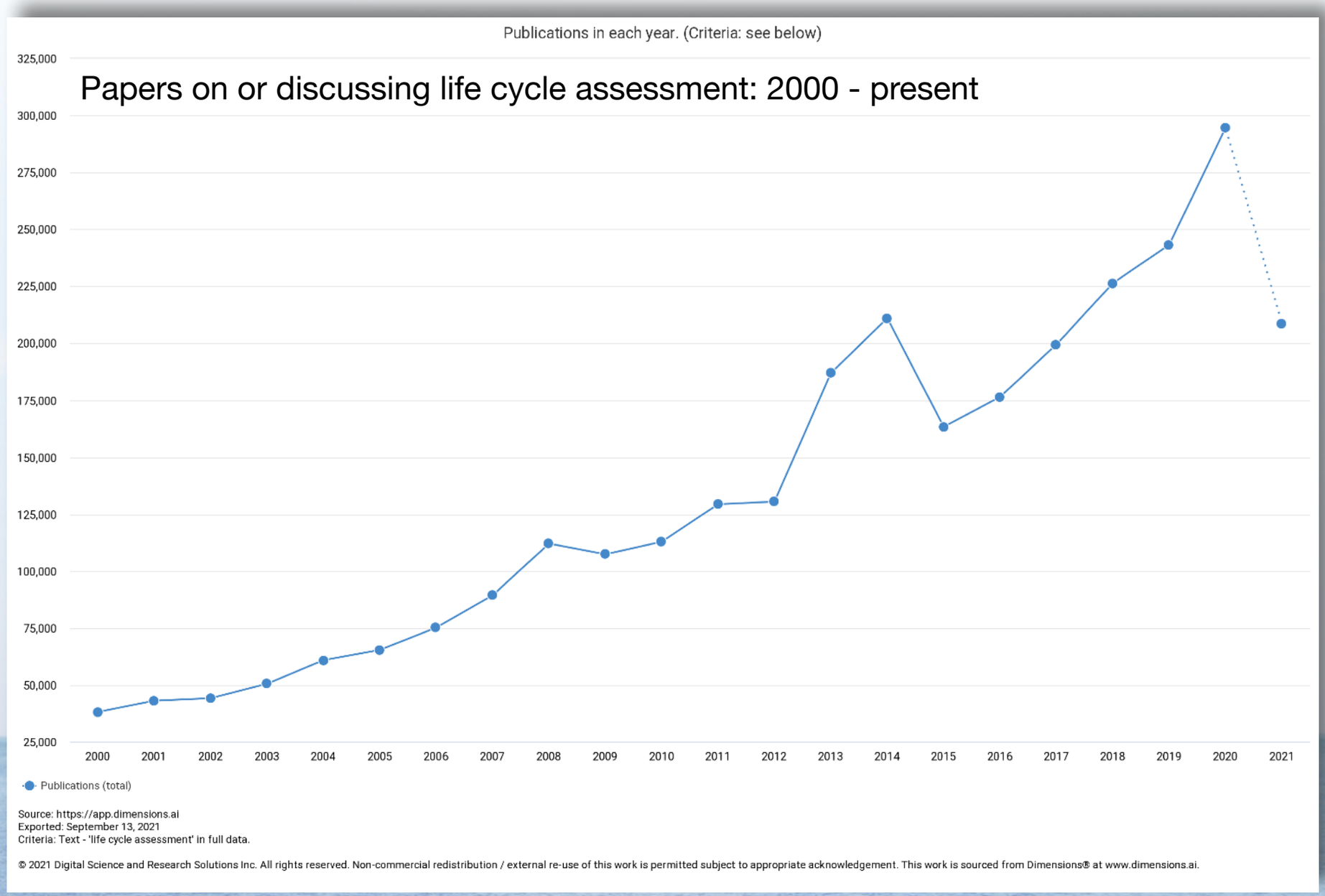
Working effectively together

Water, water everywhere

Nor any drop to drink

Water, water everywhere

Nor any drop to drink



Source: dimensions.ai

Working effectively together

Common nomenclature is critical

- Data formats: ecospold, ILCD, OLCA, SimaPro CSV, etc
  - War is over, we all won

Working effectively together

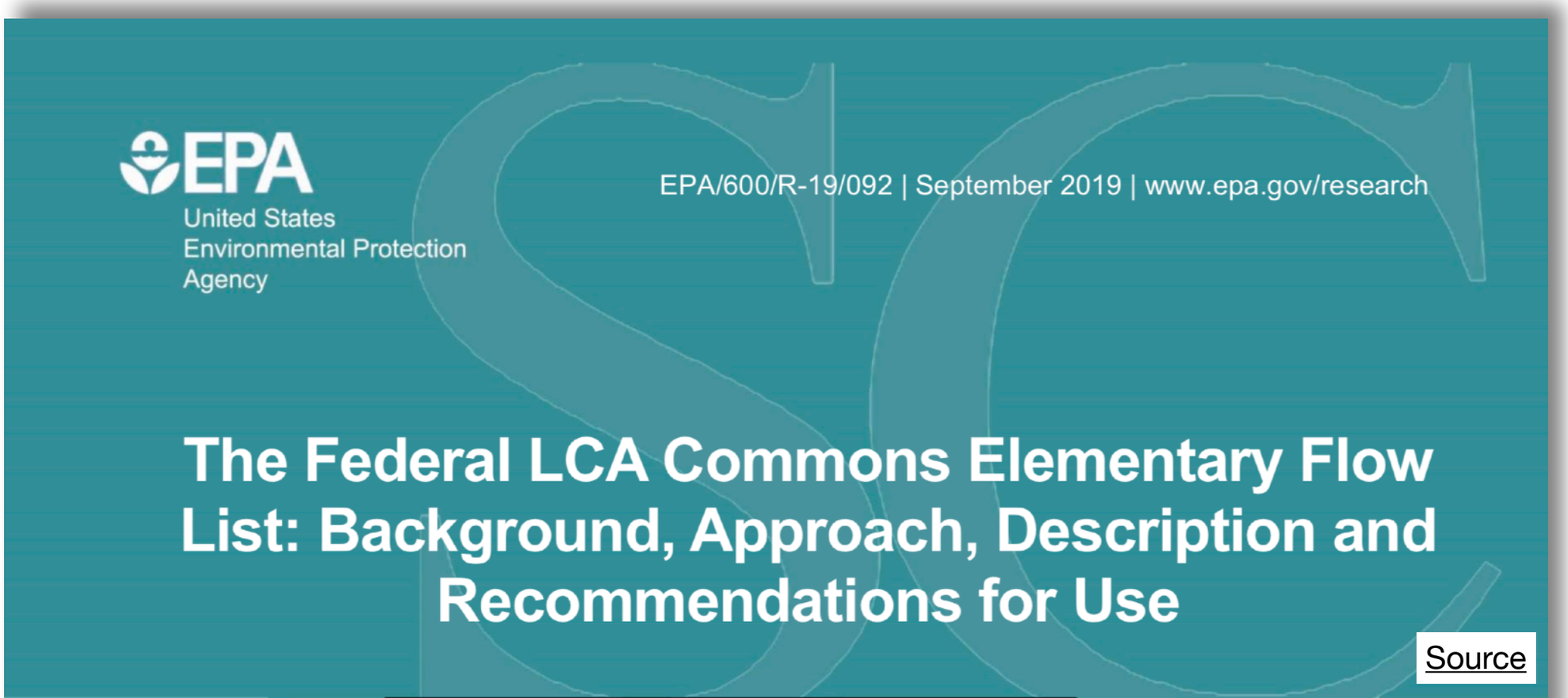
Common nomenclature is critical

- Data formats: ecospold, ILCD, OLCA, SimaPro CSV, etc
  - War is over, we all won
- Nomenclature is still the **key blocker** for sharing data
  - Reuse existing nomenclature lists instead of reinventing wheels

Working effectively together

Common nomenclature is critical

- Data formats: ecospold, ILCD, OLCA, SimaPro CSV, etc
  - War is over, we all won
- Nomenclature is still the **key blocker** for sharing data
  - Reuse existing nomenclature lists instead of reinventing wheels



Source

Working effectively together

Break out of silos

- Data formats: ecospold, ILCD, OLCA, SimaPro CSV, etc
  - War is over, we all won
- Nomenclature is still the **key blocker** for sharing data
  - Reuse existing nomenclature lists instead of reinventing wheels
- Start modelling with a strategy for data reuse (FAIR)
  - Use common or correct names and add proxies

Working effectively together

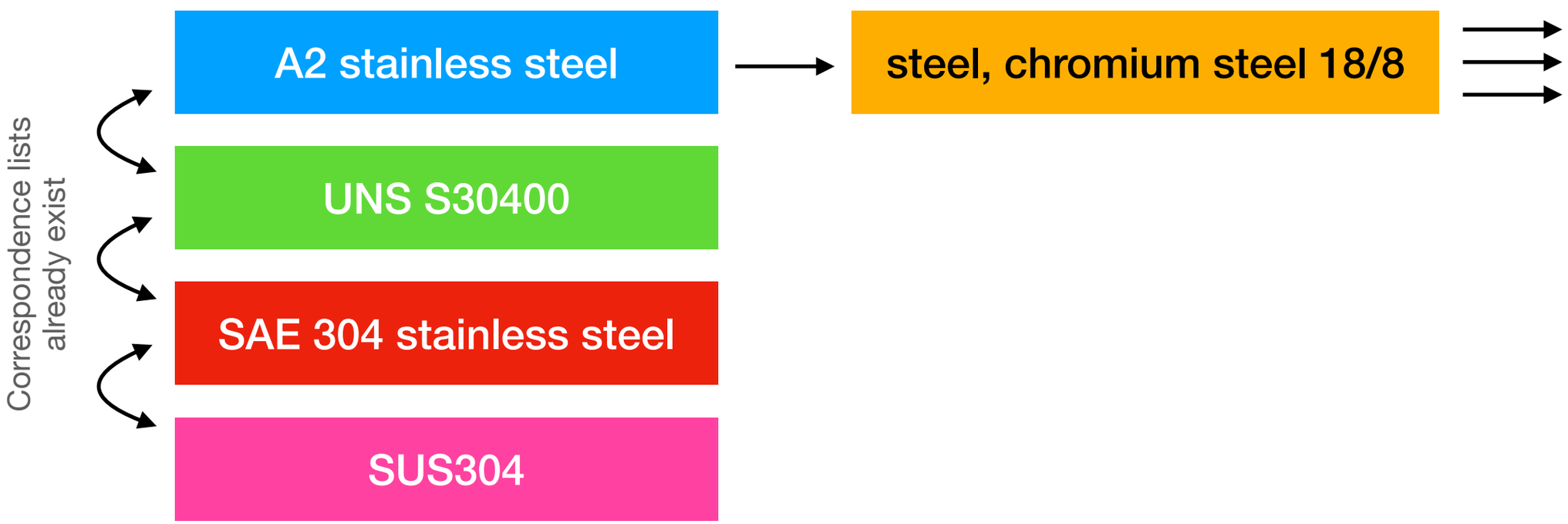
Break out of silos

- Data formats: ecospold, ILCD, OLCA, SimaPro CSV, etc
  - War is over, we all won
- Nomenclature is still the **key blocker** for sharing data
  - Reuse existing nomenclature lists instead of reinventing wheels
- Start modelling with a strategy for data reuse (FAIR)
  - Use common or correct names and add proxies

Working effectively together

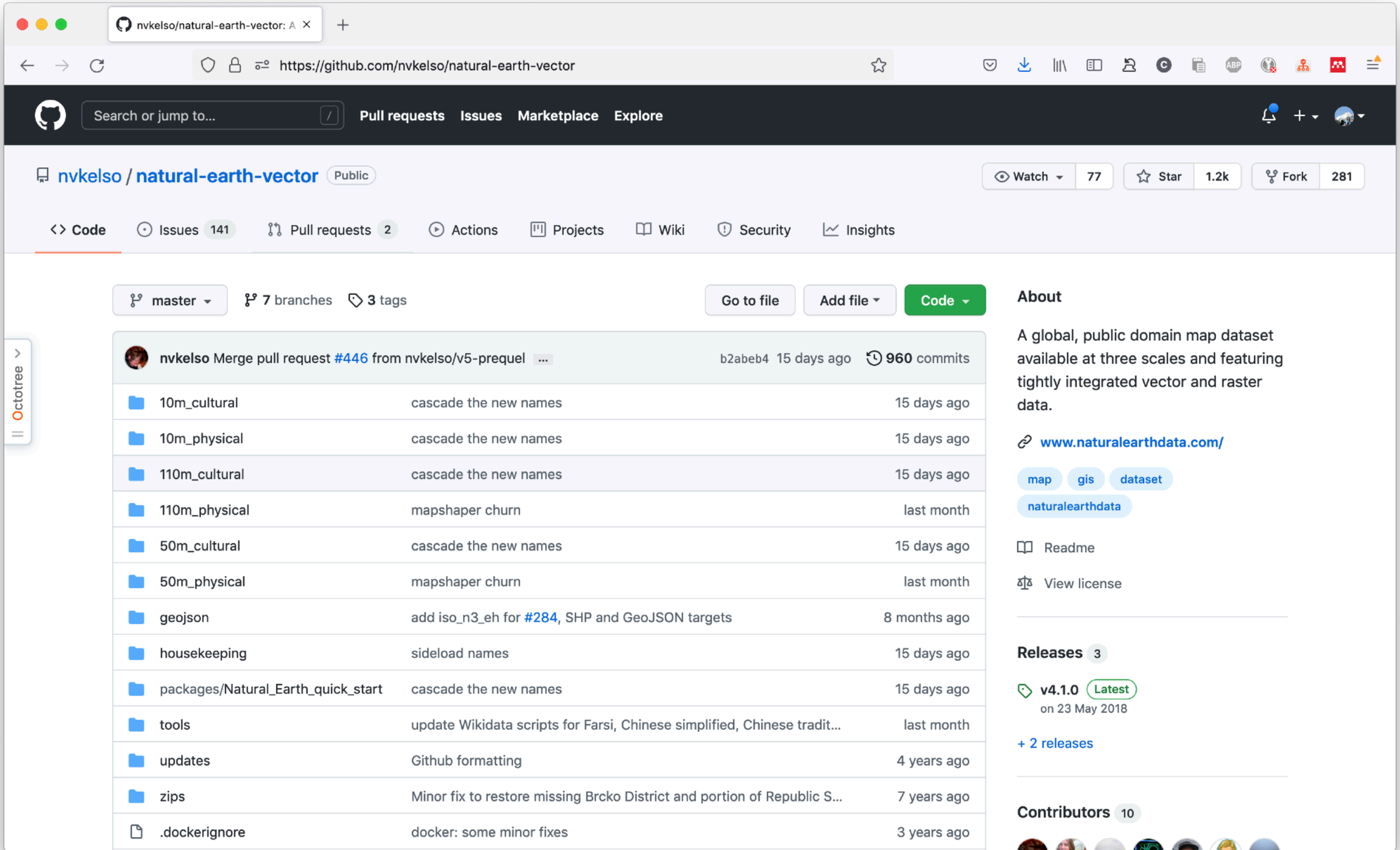
Break out of silos

- Data formats: ecospold, ILCD, OLCA, SimaPro CSV, etc
  - War is over, we all won
- Nomenclature is still the **key blocker** for sharing data
  - Reuse existing nomenclature lists instead of reinventing wheels
- Start modelling with a strategy for data reuse (FAIR)
  - Use common or correct names and add proxies



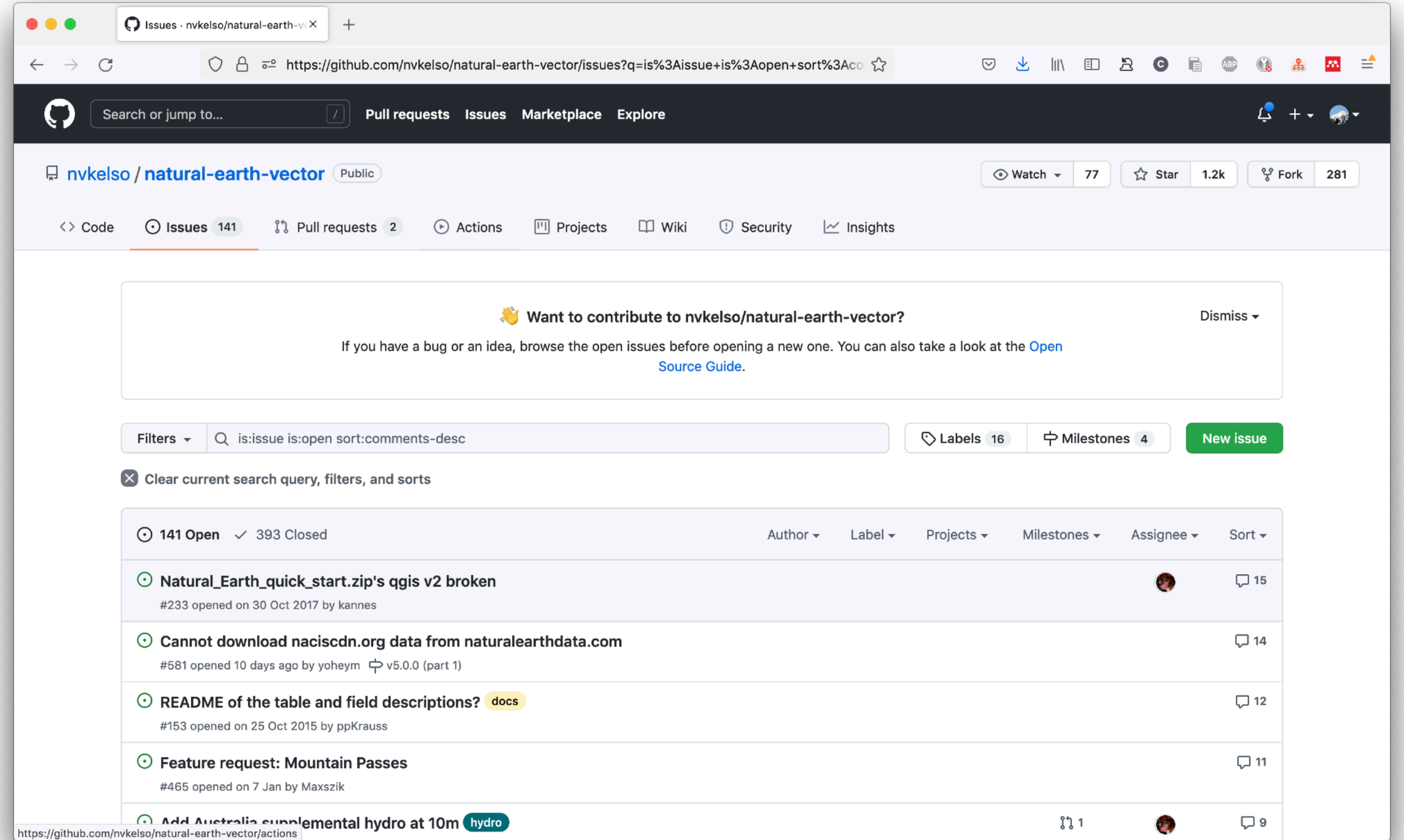
Working effectively together

Using modern data infrastructure



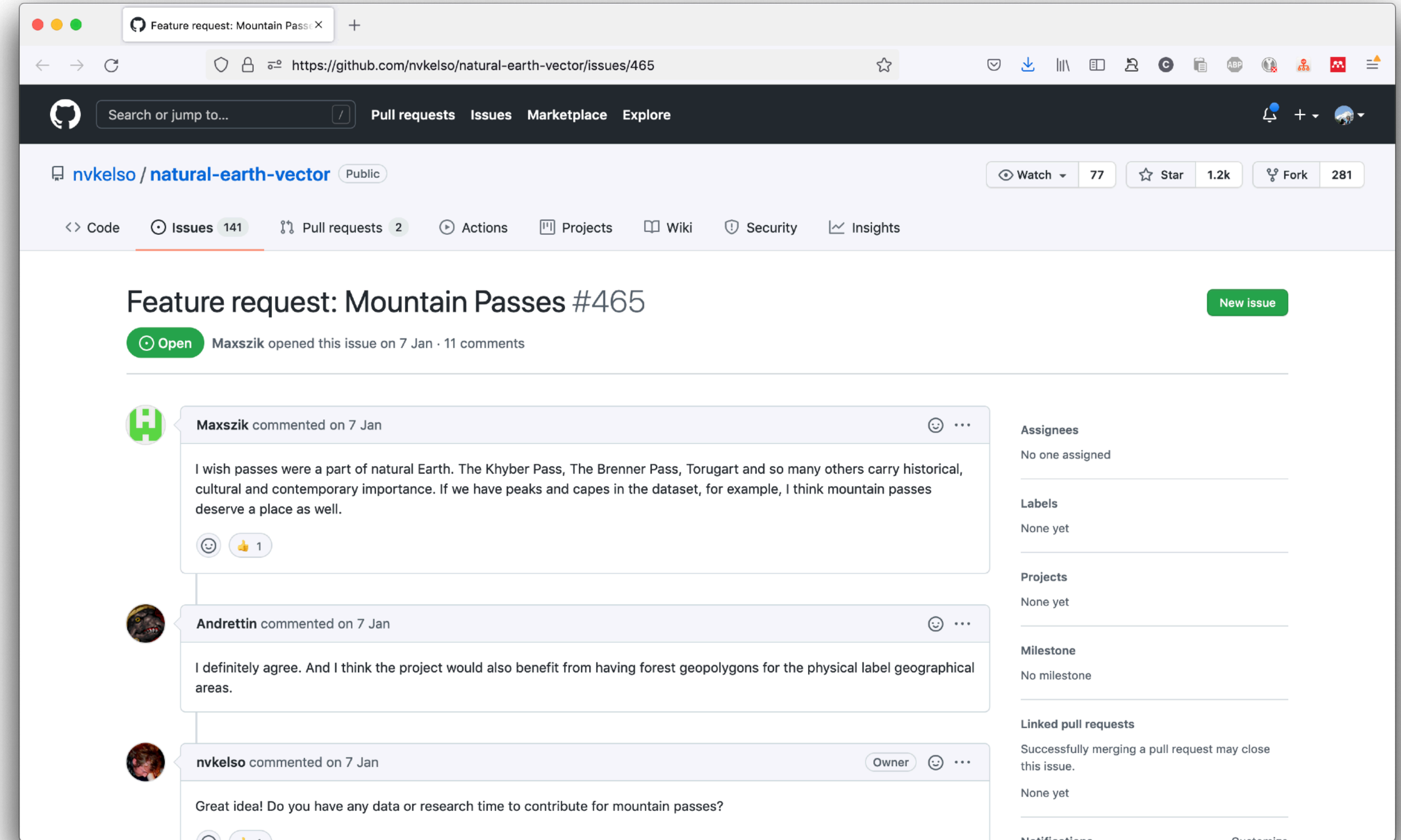
Working effectively together

Using modern data infrastructure



Working effectively together

Using modern data infrastructure



Working effectively together

Using modern data infrastructure

Feature request: Mountain Pass

https://github.com/nvkelso/natural-earth-vector/issues/465

Open **Feature request: Mountain Passes** #465

Maxszik opened this issue on 7 Jan · 11 comments

ImreSamu commented on 8 Jan — Collaborator

Wikidata info:

- "mountain pass" : https://www.wikidata.org/wiki/Q133056
- basic WikidataQuery (MountenPass AND has a coordinate!)
  - https://w.wiki/tdv + "Execute Query" !
    - now:20631 results (needs more cleaning; deduplication , ...)
    - with optional: English wikipedia links (`?articleEN`) ; mountainRange ; Elevation , Country)
    - adapt/modify - and press `</>Code>` or Download

</> Code Download

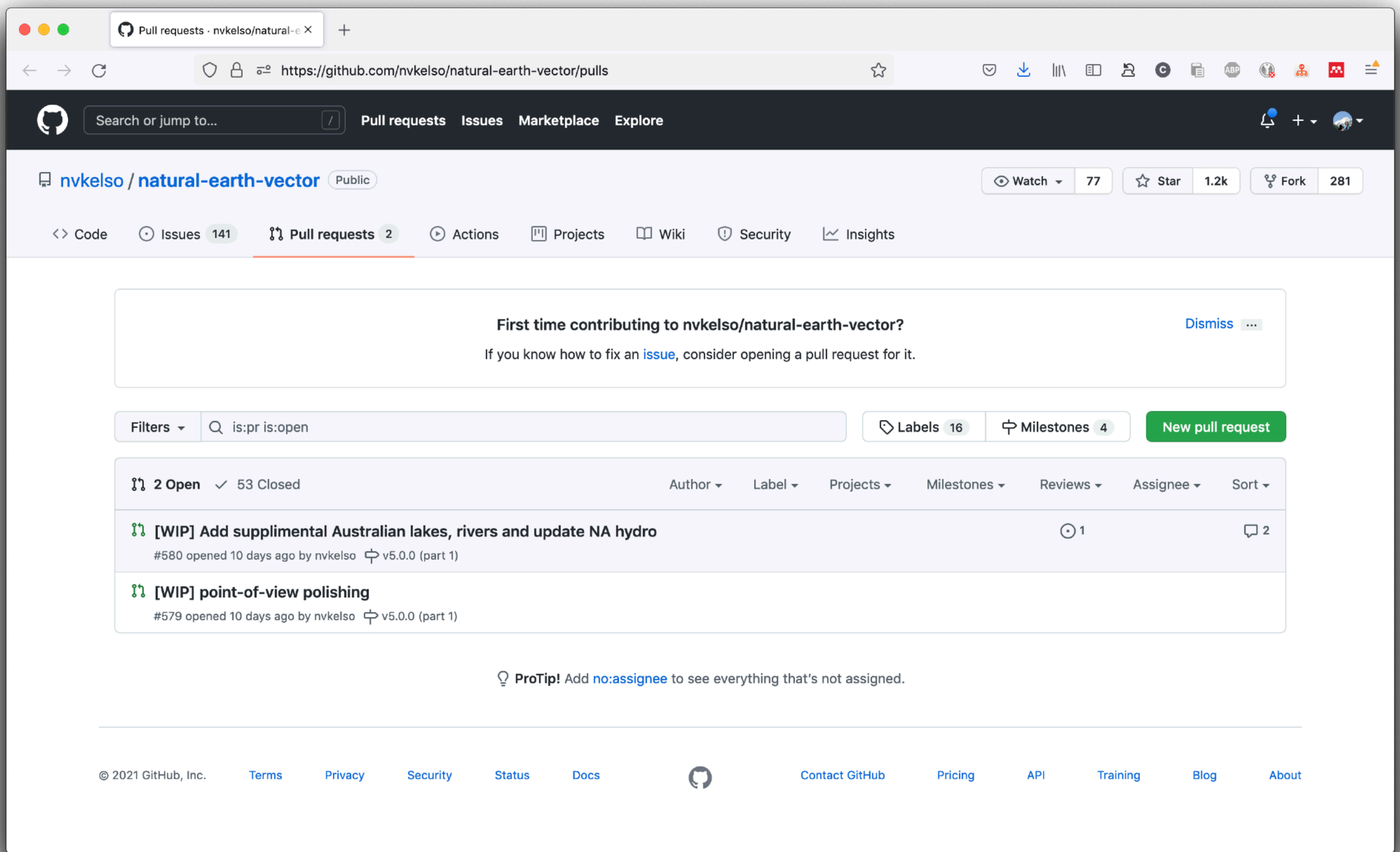
- `wdtaxonomy Q133056` - imho: useless ..

```
mountain pass (Q133056) •81 ×21460 ↑↑
├─silniční sedlo (Q12054251) •1
├─Passhöhe (Q14524467) •2 ×2
├─road mountain pass (Q43675388) ×82
│ └─Tōge (Q10383863) •6
├─rail mountain pass (Q46112269) ×48
└─Talwasserscheide (Q85871133) ×1 ↑
```

Map view:

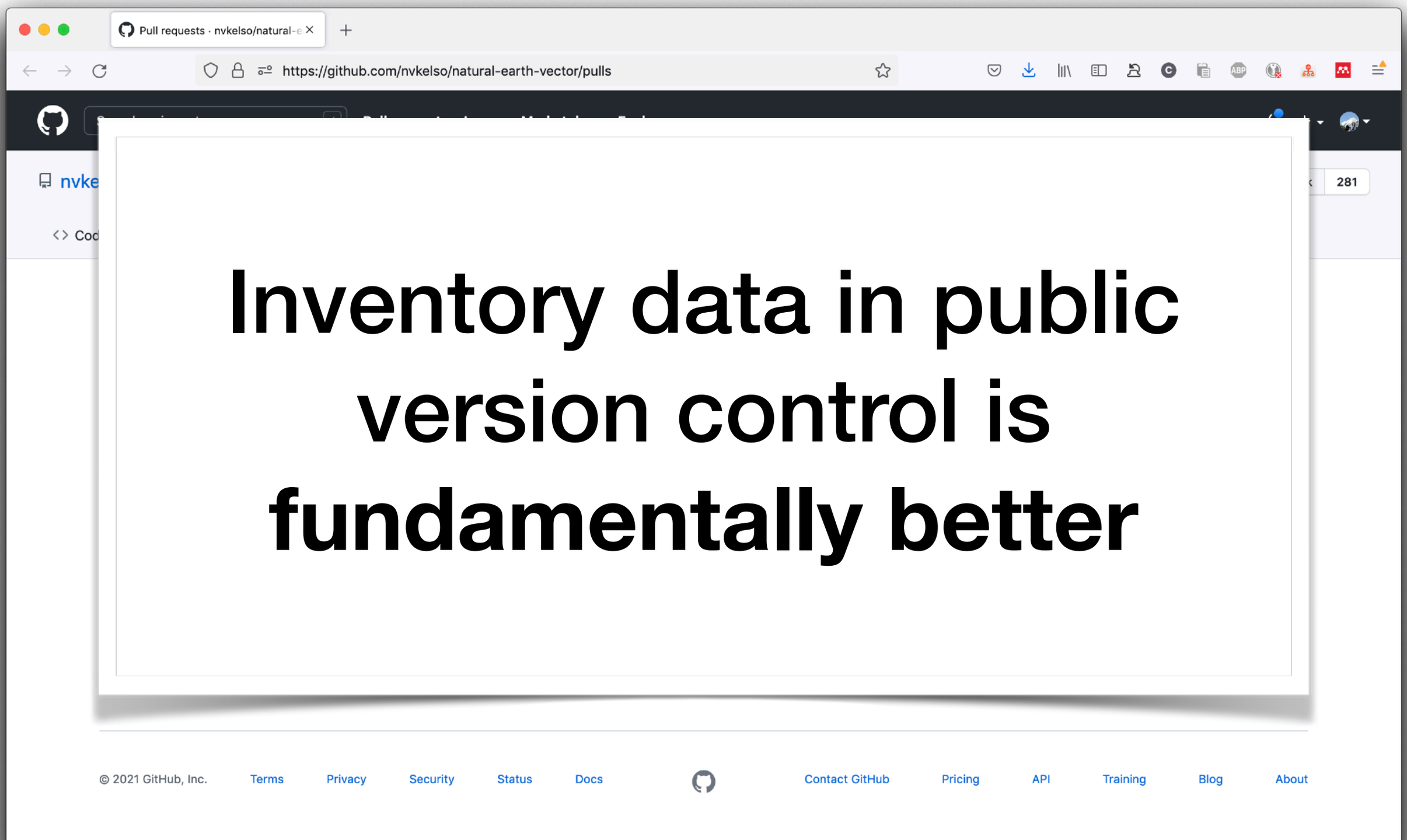
Working effectively together

Using modern data infrastructure



Working effectively together

Using modern data infrastructure



Working effectively together

Role of ecoinvent

ecoinvent is a community resource!

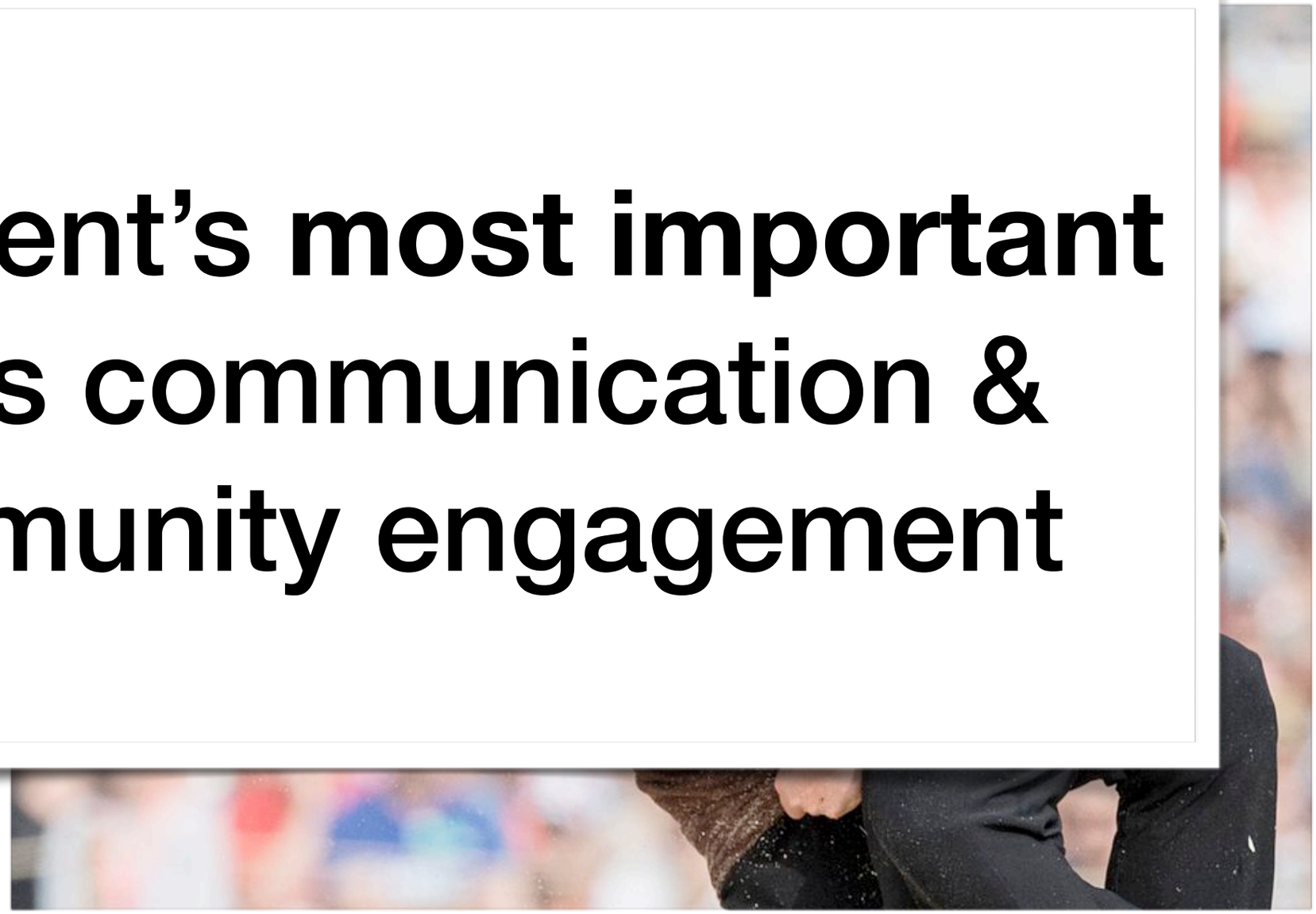
ecoinvent is a private organisation!

Working effectively together

Role of ecoinvent

ecoinvent is a community resource!

ecoinvent's **most important job** is communication & community engagement



Working effectively together

Role of ecoinvent: Some specific suggestions

- All meeting minutes should be compiled and public

Working effectively together

Role of ecoinvent: Some specific suggestions

- All meeting minutes should be compiled and public
- Open ecoinvent data should be FAIR

Working effectively together

Role of ecoinvent: Some specific suggestions

- All meeting minutes should be compiled and public
- Open ecoinvent data should be FAIR
- User community should have an ombudsman

Working effectively together

Role of ecoinvent: Some specific suggestions

- All meeting minutes should be compiled and public
- Open ecoinvent data should be FAIR
- User community should have an ombudsman
- All substantial decisions should follow a proposal template

Working effectively together

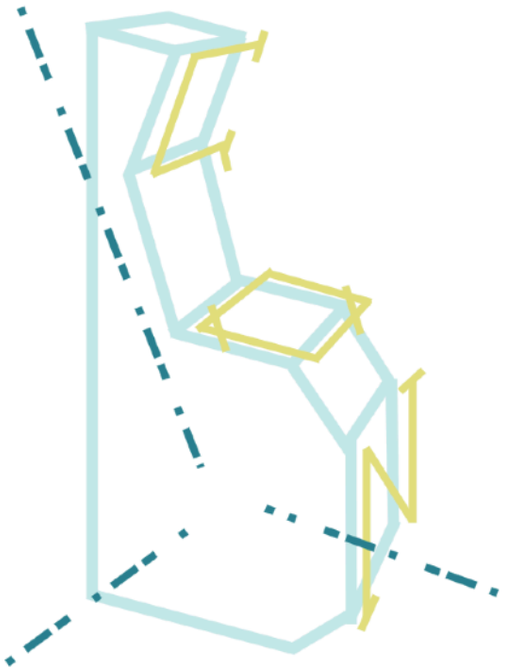
Role of ecoinvent: Some specific suggestions

- All meeting minutes should be compiled and public
- Open ecoinvent data should be FAIR
- User community should have an ombudsman
- All substantial decisions should follow a proposal template
- All master data should be on Github

Why ecoinvent?

Conclusion: **If we took climate change seriously, we would demand radical change** to LCA availability to allow it to inform decisions by **everyone everywhere**

Thanks!



Brightcon 2021 🚀 🎉 👩‍💻

Sept. 15 (tomorrow), free

Website: brightcon.link

- Slides, notebooks, and article (soon): https://chris.mutel.org
- Image credits:
  - https://www.flickr.com/photos/jakeprzespo/4729533660/
  - https://www.swisscommunity.org/en/news-media/swiss-review/article/a-new-star-in-swiss-wrestling#gallery-1
  - http://www.picturequotes.com/i-still-love-you-quote-555478