

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 CO₂ totals

Compare with Global Carbon Budget 2019

Earth Syst. Sci. Data, 12, 3269–3340, 2020

<https://doi.org/10.5194/essd-12-3269-2020>

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

Open Access Earth System
Science
Data

Global Carbon Budget 2020

Pierre Friedlingstein^{1,2}, Michael O’Sullivan², Matthew W. Jones³, Robbie M. Andrew⁴, Judith Hauck⁵, Are Olsen^{6,7}, Glen P. Peters⁴, Wouter Peters^{8,9}, Julia Pongratz^{10,11}, Stephen Sitch¹², Corinne Le Quéré³, Josep G. Canadell¹³, Philippe Ciais¹⁴, Robert B. Jackson¹⁵, Simone Alin¹⁶, Luiz E. O. C. Aragão^{17,12}, Almut Arneth¹⁸, Vivek Arora¹⁹, Nicholas R. Bates^{20,21}, Meike Becker^{6,7}, Alice Benoit-Cattin²², Henry C. Bittig²³, Laurent Bopp²⁴, Selma Bultan¹⁰, Naveen Chandra^{25,26}, Frédéric Chevallier¹⁴, Louise P. Chini²⁷, Wiley Evans²⁸, Liesbeth Florentie⁸, Piers M. Forster²⁹, Thomas Gasser³⁰, Marion Gehlen¹⁴, Dennis Gilfillan³¹, Thanos Gkrizalis³², Luke Gregor³³, Nicolas Gruber³³, Ian Harris³⁴, Kerstin Hartung^{10,a}, Vanessa Haverd¹³, Richard A. Houghton³⁵, Tatiana Ilyina¹¹, Atul K. Jain³⁶, Emilie Joetzjer³⁷, Koji Kadono³⁸, Etsushi Kato³⁹, Vassilis Kitidis⁴⁰, Jan Ivar Korsbakken⁴, Peter Landschützer¹¹, Nathalie Lefèvre⁴¹, Andrew Lenton⁴², Sebastian Lienert⁴³, Zhu Liu⁴⁴, Danica Lombardozzi⁴⁵, Gregg Marland^{31,46}, Nicolas Metzl⁴¹, David R. Munro^{47,48}, Julia E. M. S. Nabel¹¹, Shin-Ichiro Nakaoka²⁶, Yosuke Niwa^{26,49}, Kevin O’Brien^{50,16}, Tsuneo Ono⁵¹, Paul I. Palmer^{52,53}, Denis Pierrot⁵⁴, Benjamin Poulter⁵⁵, Laure Resplandy⁵⁶, Eddy Robertson⁵⁷, Christian Rödenbeck⁵⁸, Jörg Schwinger^{59,7}, Roland Séférian³⁷, Ingunn Skjelvan^{59,7}, Adam J. P. Smith³, Adrienne J. Sutton¹⁶, Toste Tanhua⁶⁰, Pieter P. Tans⁶¹, Hanqin Tian⁶², Bronte Tilbrook^{42,63}, Guido van der Werf⁶⁴, Nicolas Vuichard¹⁴, Anthony P. Walker⁶⁵,

Confirmation of CO₂ totals

Compare with Global Carbon Budget 2019

Observation: 9946

Million tons Carbon

ecoinvent 3.7.1 cutoff

Confirmation of CO₂ totals

Compare with Global Carbon Budget 2019

Observation: 9946

Million tons Carbon

Model: 582057

ecoinvent 3.7.1 cutoff

Confirmation of CO₂ 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 CO₂ 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)
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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 CO₂ totals - Concrete

Compare with Global Carbon Budget 2019

Observation: 427

Million tons Carbon

ecoinvent 3.7.1 cutoff

Confirmation of CO₂ totals - Concrete

Compare with Global Carbon Budget 2019

Observation: 427

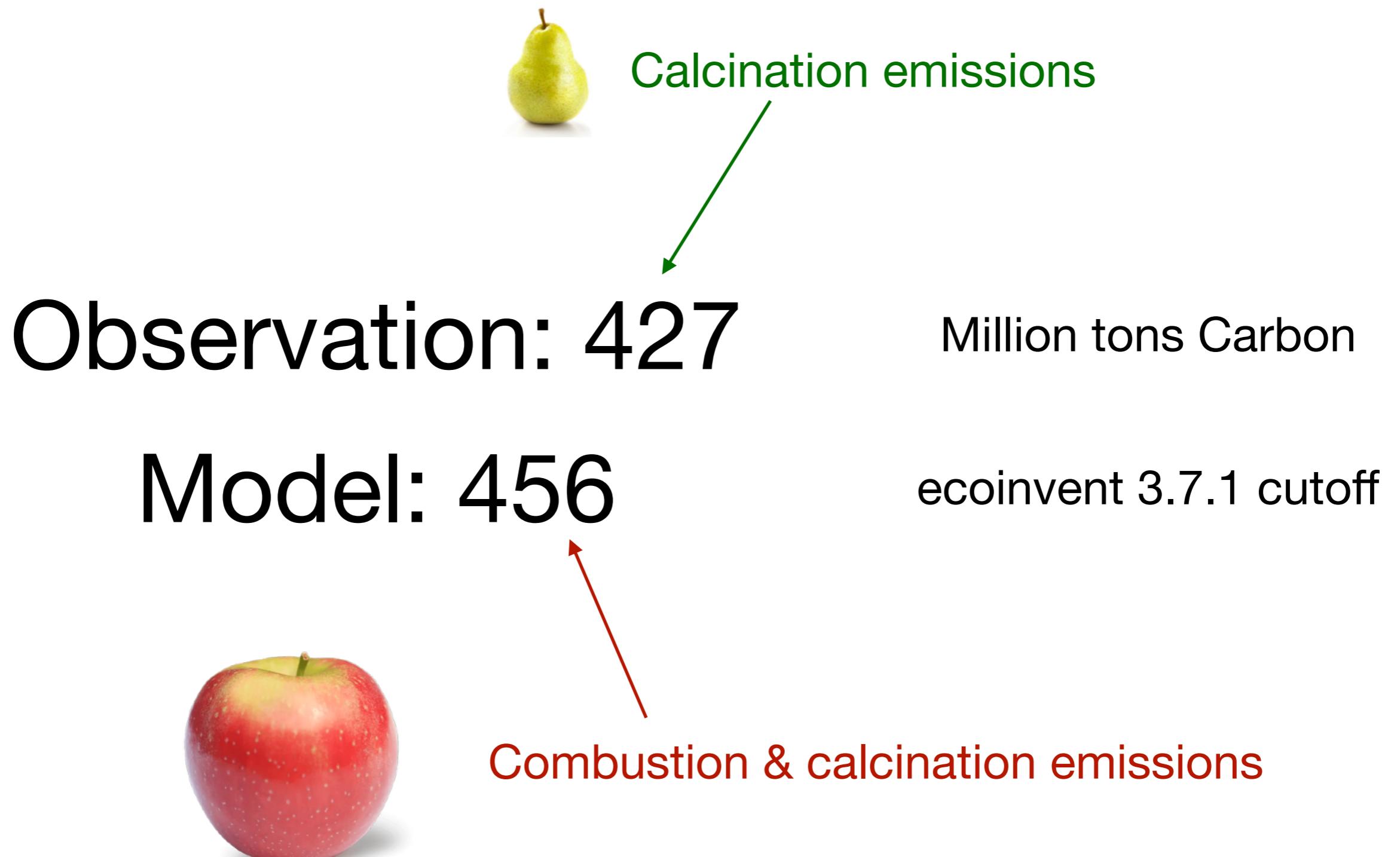
Million tons Carbon

Model: 456

ecoinvent 3.7.1 cutoff

Confirmation of CO₂ totals - Concrete

Compare with Global Carbon Budget 2019



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 CH₄ totals

Compare with Global Methane Budget 2017

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

The Global Methane Budget 2000–2017

Marielle Saunois¹, Ann R. Stavert², Ben Poulter³, Philippe Bousquet¹, Josep G. Canadell², Robert B. Jackson⁴, Peter A. Raymond⁵, Edward J. Dlugokencky⁶, Sander Houweling^{7,8}, Prabir K. Patra^{9,10}, Philippe Ciais¹, Vivek K. Arora¹¹, David Bastviken¹², Peter Bergamaschi¹³, Donald R. Blake¹⁴, Gordon Brailsford¹⁵, Lori Bruhwiler⁶, Kimberly M. Carlson^{16,17}, Mark Carroll⁷⁰, Simona Castaldi^{18,19,20}, Naveen Chandra⁹, Cyril Crevoisier²¹, Patrick M. Crill²², Kristofer Covey²³, Charles L. Curry^{24,71}, Giuseppe Etiope^{25,26}, Christian Frankenberg^{27,28}, Nicola Gedney²⁹, Michaela I. Hegglin³⁰, Lena Höglund-Isaksson³¹, Gustaf Hugelius³², Misa Ishizawa³³, Akihiko Ito³³, Greet Janssens-Maenhout¹³, Katherine M. Jensen³⁴, Fortunat Joos³⁵, Thomas Kleinen³⁶, Paul B. Krummel³⁷, Ray L. Langenfelds³⁷, Goulven G. Laruelle³⁸, Licheng Liu³⁹, Toshinobu Machida³³, Shamil Maksyutov³³, Kyle C. McDonald³⁴, Joe McNorton⁴⁰, Paul A. Miller⁴¹, Joe R. Melton⁴², Isamu Morino³³, Jurek Müller³⁵, Fabiola Murguia-Flores⁴³, Vaishali Naik⁴⁴, Yosuke Niwa^{33,45}, Sergio Noce²⁰, Simon O'Doherty⁴⁶, Robert J. Parker⁴⁷, Changhui Peng⁴⁸, Shushi Peng⁴⁹, Glen P. Peters⁵⁰, Catherine Prigent⁵¹, Ronald Prinn⁵², Michel Ramonet¹, Pierre Regnier³⁸, William J. Riley⁵³, Judith A. Rosentreter⁵⁴, Arjo Segers⁵⁵, Isobel J. Simpson¹⁴, Hao Shi⁵⁶, Steven J. Smith^{57,58}, L. Paul Steele³⁷, Brett F. Thornton²², Hanqin Tian⁵⁶, Yasunori Tohjima⁷², Francesco N. Tubiello⁵⁹, Aki Tsuruta⁶⁰, Nicolas Viovy¹, Apostolos Voulgarakis^{61,62}, Thomas S. Weber⁶³,
Mic <https://essd.copernicus.org/articles/12/1561/2020/essd-12-1561-2020.html> ch⁶⁷,
Yi Yin^{1,2,1}, Yukio Yoshida^{2,2}, Wenxin Zhang^{2,1}, Zhen Zhang^{2,2}, Yuanhong Zhao¹, Bo Zheng¹, Qing Zhu⁵³,

Confirmation of CH₄ totals

Compare with Global Methane Budget 2017

Observation: 332-406

Million tons CH₄

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

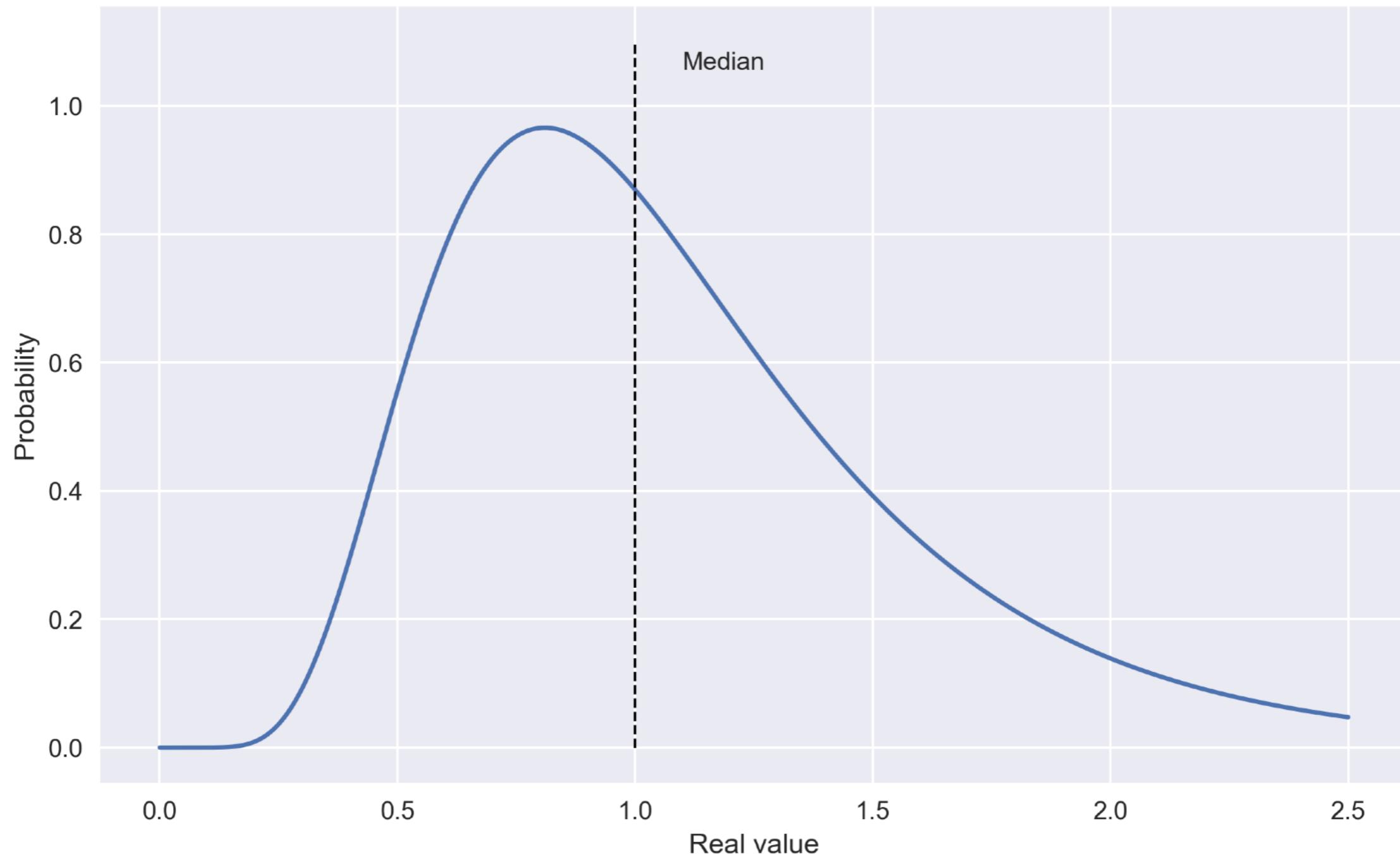
Sensitivity analysis of Swiss consumption

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)

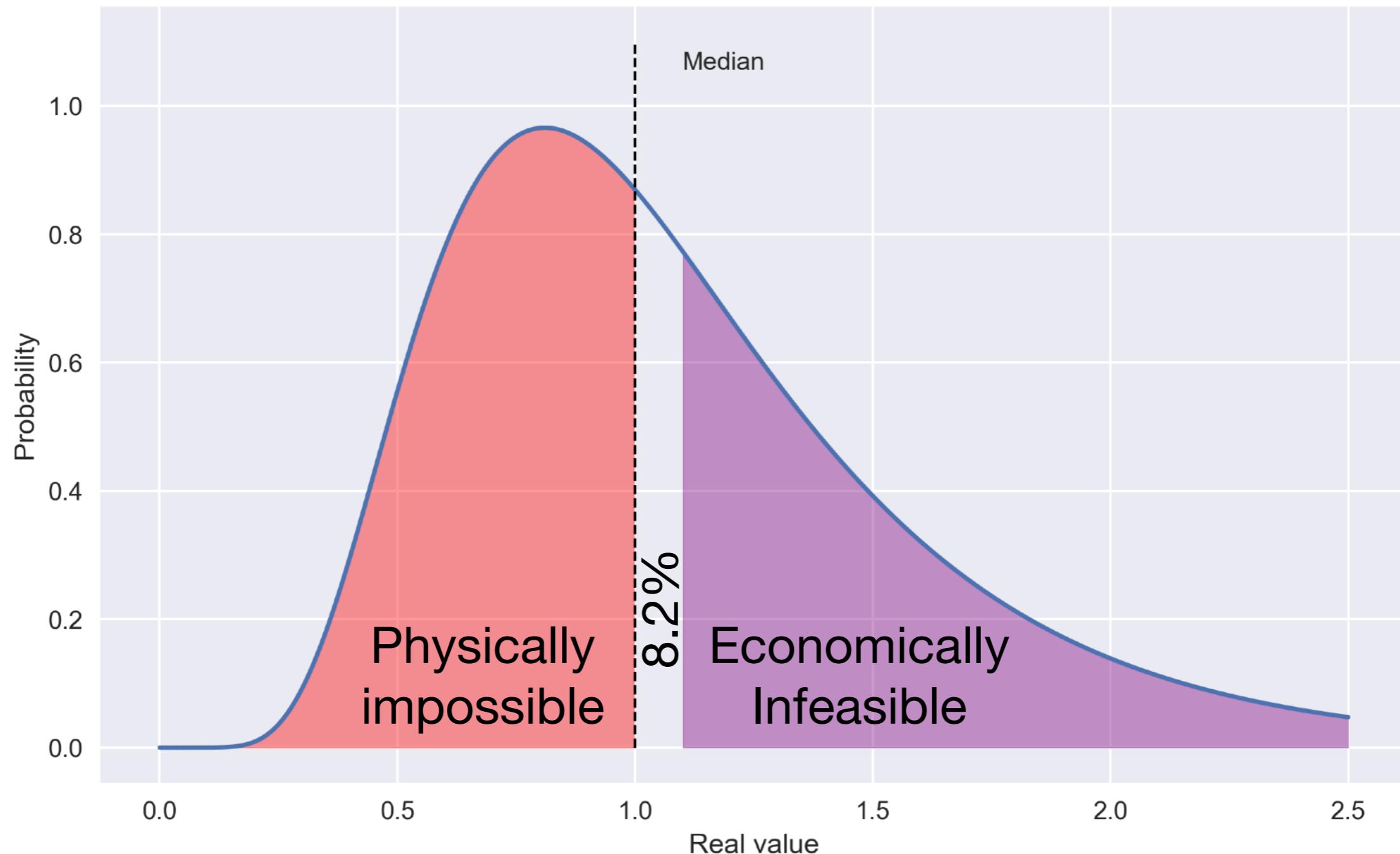
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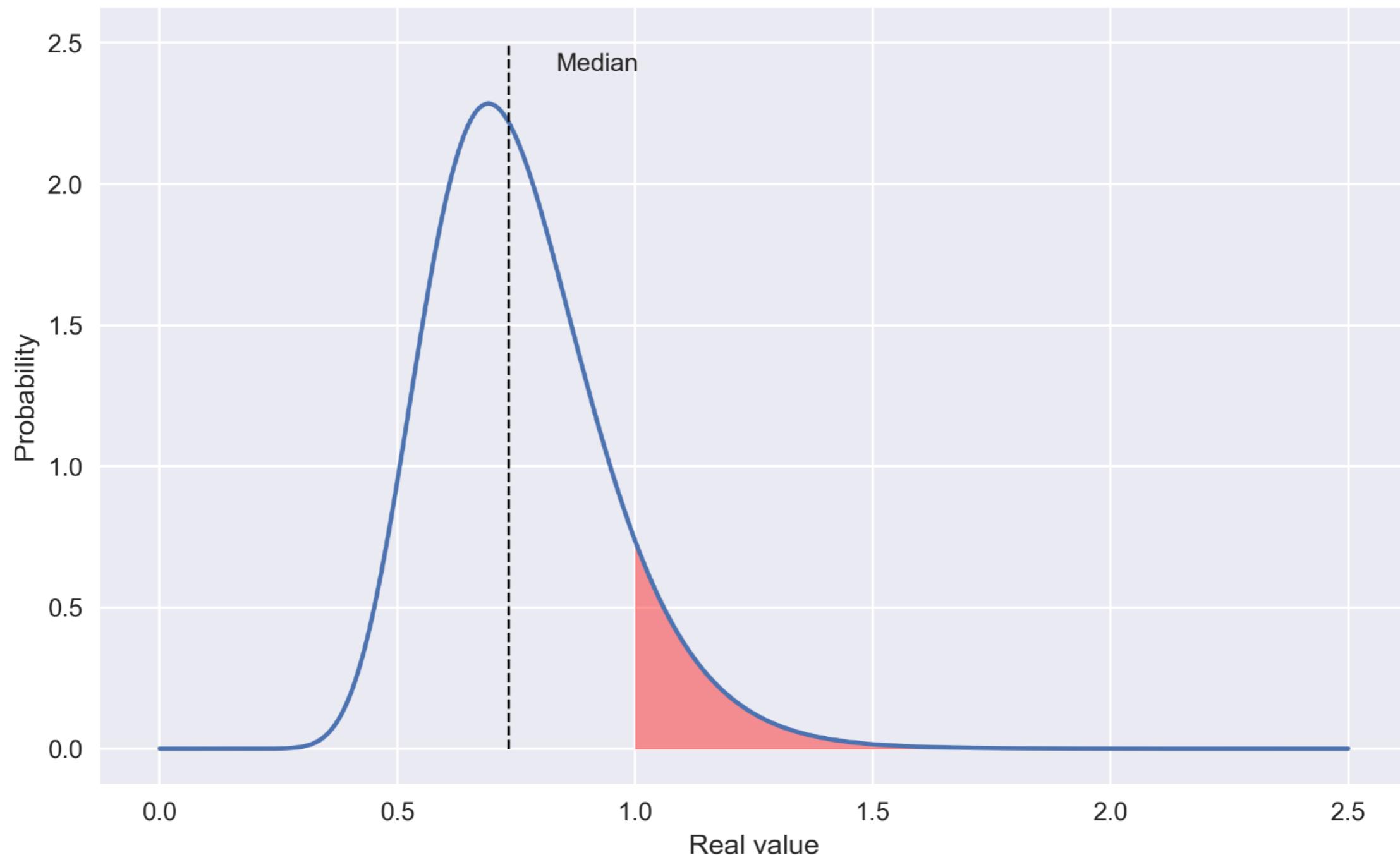
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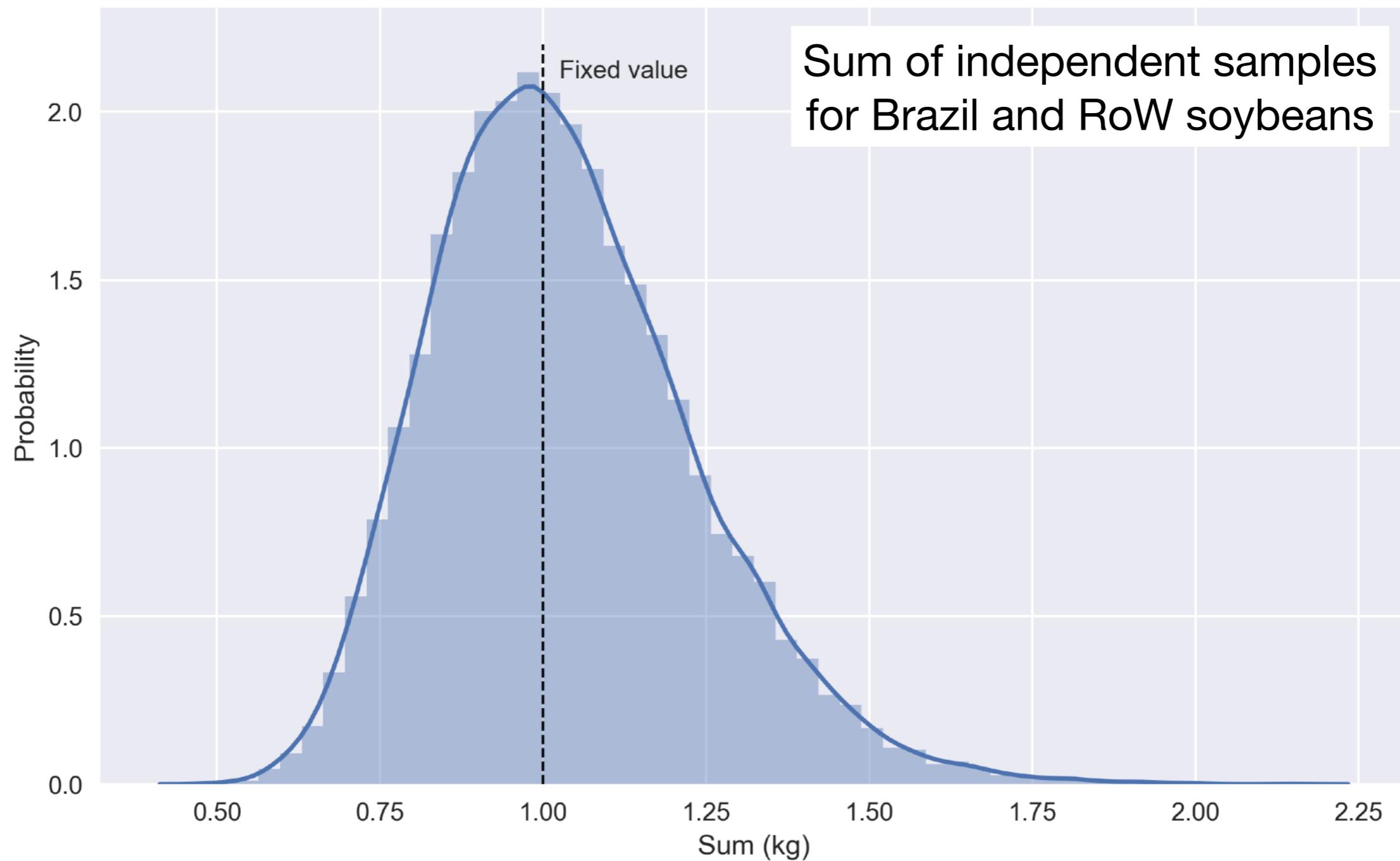
Sensitivity analysis of Swiss consumption

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.**

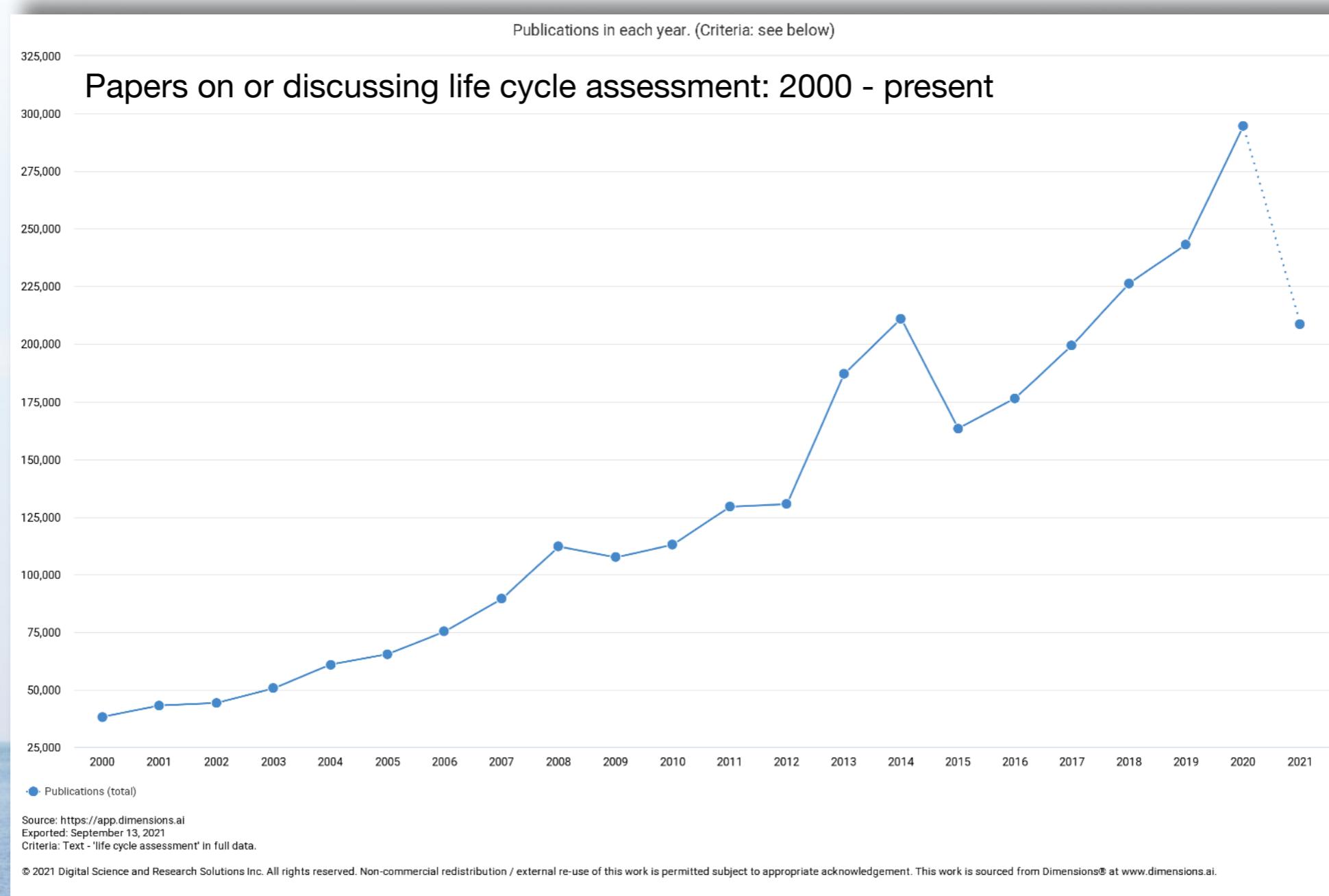
Working effectively together

**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

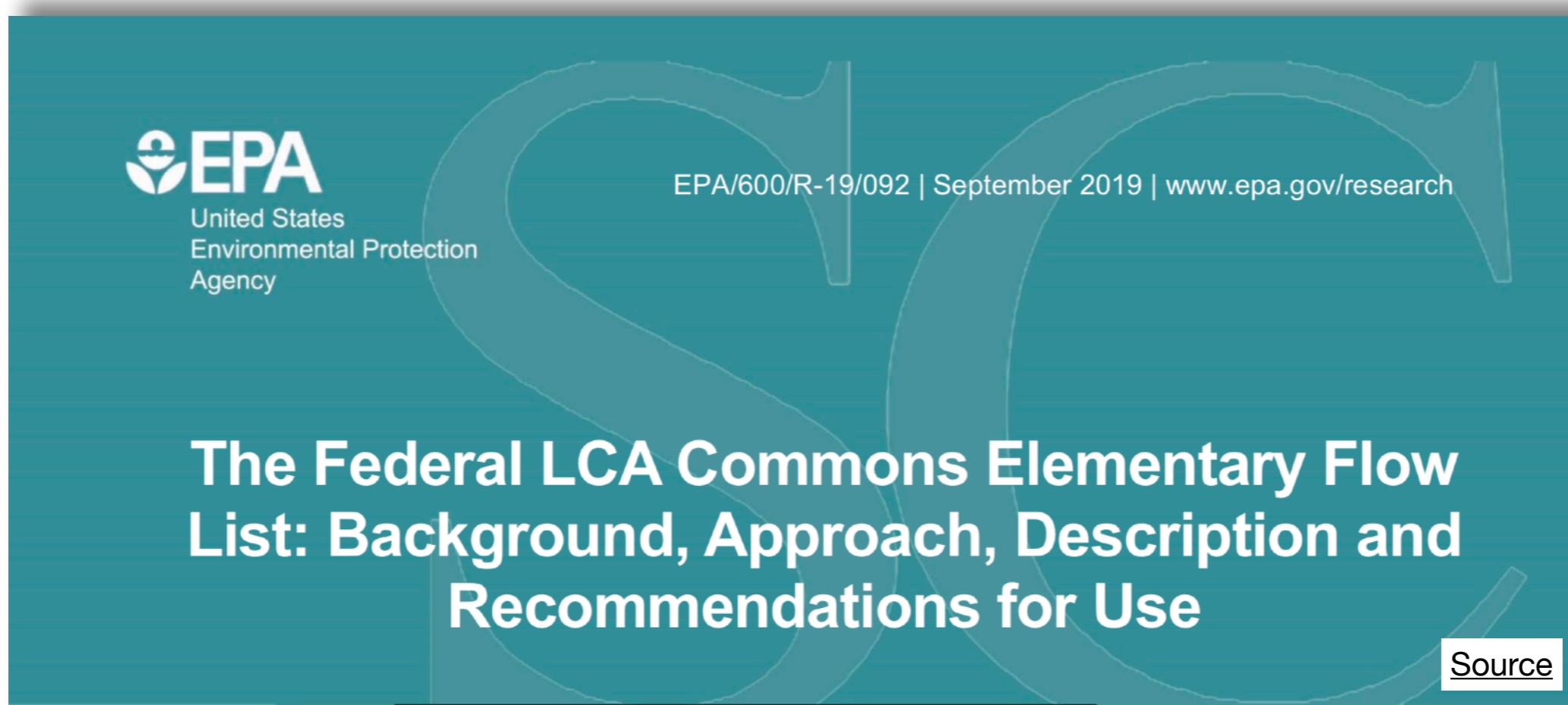
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- Nomenclature is still the **key blocker** for sharing data
 - Reuse existing nomenclature lists instead of reinventing wheels

Working effectively together

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[Source](#)

Working effectively together

Break out of silos

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 - 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

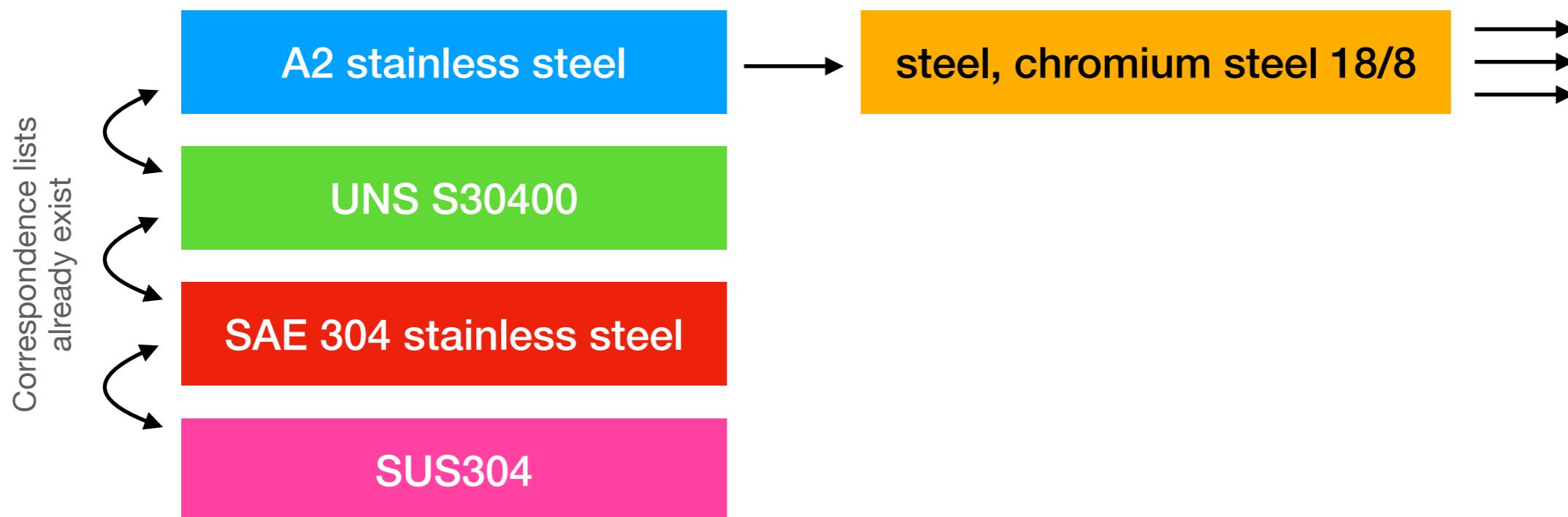
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Working effectively together

Using modern data infrastructure

The screenshot shows a GitHub repository page for `nvkelso/natural-earth-vector`. The repository is public, has 141 issues, 2 pull requests, and 281 forks. It features a sidebar with an Octotree navigation. The main content area displays a list of recent commits from the master branch, showing contributions from various authors and their descriptions. On the right side, there's an 'About' section with a description of the dataset, links to its website and license, and sections for releases and contributors.

About

A global, public domain map dataset available at three scales and featuring tightly integrated vector and raster data.

www.naturalearthdata.com/

map gis dataset
naturalearthdata

[Readme](#) [View license](#)

Releases 3

v4.1.0 Latest on 23 May 2018 + 2 releases

Contributors 10

Author	Commit Message	Date
nvkelso	Merge pull request #446 from nvkelso/v5-prequel ...	b2abeb4 15 days ago
	10m_cultural cascade the new names	15 days ago
	10m_physical cascade the new names	15 days ago
	110m_cultural cascade the new names	15 days ago
	110m_physical mapshaper churn	last month
	50m_cultural cascade the new names	15 days ago
	50m_physical mapshaper churn	last month
	geojson add iso_n3_eh for #284, SHP and GeoJSON targets	8 months ago
	housekeeping sideload names	15 days ago
	packages/Natural_Earth_quick_start cascade the new names	15 days ago
	tools update Wikidata scripts for Farsi, Chinese simplified, Chinese tradit...	last month
	updates Github formatting	4 years ago
	zips Minor fix to restore missing Brcko District and portion of Republic S...	7 years ago
	.dockerignore docker: some minor fixes	3 years ago

Working effectively together

Using modern data infrastructure

The screenshot shows a GitHub Issues page for the repository `nvkelso/natural-earth-vector`. The page has a dark theme. At the top, there's a navigation bar with links for Pull requests, Issues, Marketplace, and Explore. Below that is a header with the repository name, a 'Public' badge, and metrics for Watch (77), Star (1.2k), Fork (281). The main content area shows a modal message encouraging contributions, followed by search filters, and a list of 141 open issues. The issues are listed in descending order of comments, with titles like "Natural_Earth_quick_start.zip's qgis v2 broken", "Cannot download naciscdn.org data from naturalearthdata.com", and "README of the table and field descriptions?". Each issue includes a link to its details, the number of comments, and a user icon.

Want to contribute to `nvkelso/natural-earth-vector`? Dismiss ▾

If you have a bug or an idea, browse the open issues before opening a new one. You can also take a look at the [Open Source Guide](#).

Filters ▾ Q is:issue is:open sort:comments-desc Labels 16 Milestones 4 New issue

× Clear current search query, filters, and sorts

141 Open	393 Closed	Author ▾	Label ▾	Projects ▾	Milestones ▾	Assignee ▾	Sort ▾
Natural_Earth_quick_start.zip's qgis v2 broken	#233 opened on 30 Oct 2017 by kannes		15				
Cannot download naciscdn.org data from naturalearthdata.com	#581 opened 10 days ago by yoheym		14	v5.0.0 (part 1)			
README of the table and field descriptions?	docs		12				
Feature request: Mountain Passes	#465 opened on 7 Jan by Maxszik		11				
Add Australia supplemental hydro at 10m	hydro		9				

Working effectively together

Using modern data infrastructure

The screenshot shows a GitHub issue page for a project named "natural-earth-vector". The issue is titled "Feature request: Mountain Passes #465". It has 141 issues and 2 pull requests. The "Issues" tab is selected. The issue itself is an open feature request from a user named Maxszik, dated January 7th. He comments that mountain passes are historically and culturally important and deserve a place in the dataset. Another user, Andrettin, agrees and suggests adding forest geopolygon labels. The project maintainer, nvkelso, responds positively, asking if the user has time to contribute. The right sidebar displays standard GitHub issue metadata: assignees (none), labels (none), projects (none), and milestones (none). It also shows linked pull requests and notifications.

Feature request: Mountain Passes #465

Maxszik opened this issue on 7 Jan · 11 comments

Maxszik commented on 7 Jan

I wish passes were a part of natural Earth. The Khyber Pass, The Brenner Pass, Torugart and so many others carry historical, cultural and contemporary importance. If we have peaks and capes in the dataset, for example, I think mountain passes deserve a place as well.

Andrettin commented on 7 Jan

I definitely agree. And I think the project would also benefit from having forest geopolygon labels for geographical areas.

nvkelso commented on 7 Jan

Great idea! Do you have any data or research time to contribute for mountain passes?

Assignees
No one assigned

Labels
None yet

Projects
None yet

Milestone
No milestone

Linked pull requests
Successfully merging a pull request may close this issue.

None yet

Notifications
Customize

Working effectively together

Using modern data infrastructure

The screenshot shows a GitHub issue page for "Feature request: Mountain Passes #465". The comment section contains a detailed explanation of Wikidata queries and results, followed by a hierarchical tree of mountain pass types and a map view.

Comment by ImreSamu:

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
- 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:

A world map with red dots representing the locations of mountain passes identified by the Wikidata query. The dots are concentrated in Europe, North America, and parts of Asia and Africa.

Working effectively together

Using modern data infrastructure

The screenshot shows a GitHub repository page for `nvkelso/natural-earth-vector`. The URL in the browser is <https://github.com/nvkelso/natural-earth-vector/pulls>. The page title is "Pull requests · nvkelso/natural-earth-vector".

The repository is public, with 77 stars, 1.2k forks, and 281 open issues. There are 2 open pull requests:

- #580 [WIP] Add supplemental Australian lakes, rivers and update NA hydro (opened 10 days ago by nvkelso)
- #579 [WIP] point-of-view polishing (opened 10 days ago by nvkelso)

A modal message at the top says "First time contributing to nvkelso/natural-earth-vector? If you know how to fix an issue, consider opening a pull request for it." with a "Dismiss" button.

Filters: is:pr is:open

Labels: 16

Milestones: 4

New pull request

Author: Author dropdown

Label: Label dropdown

Projects: Projects dropdown

Milestones: Milestones dropdown

Reviews: Reviews dropdown

Assignee: Assignee dropdown

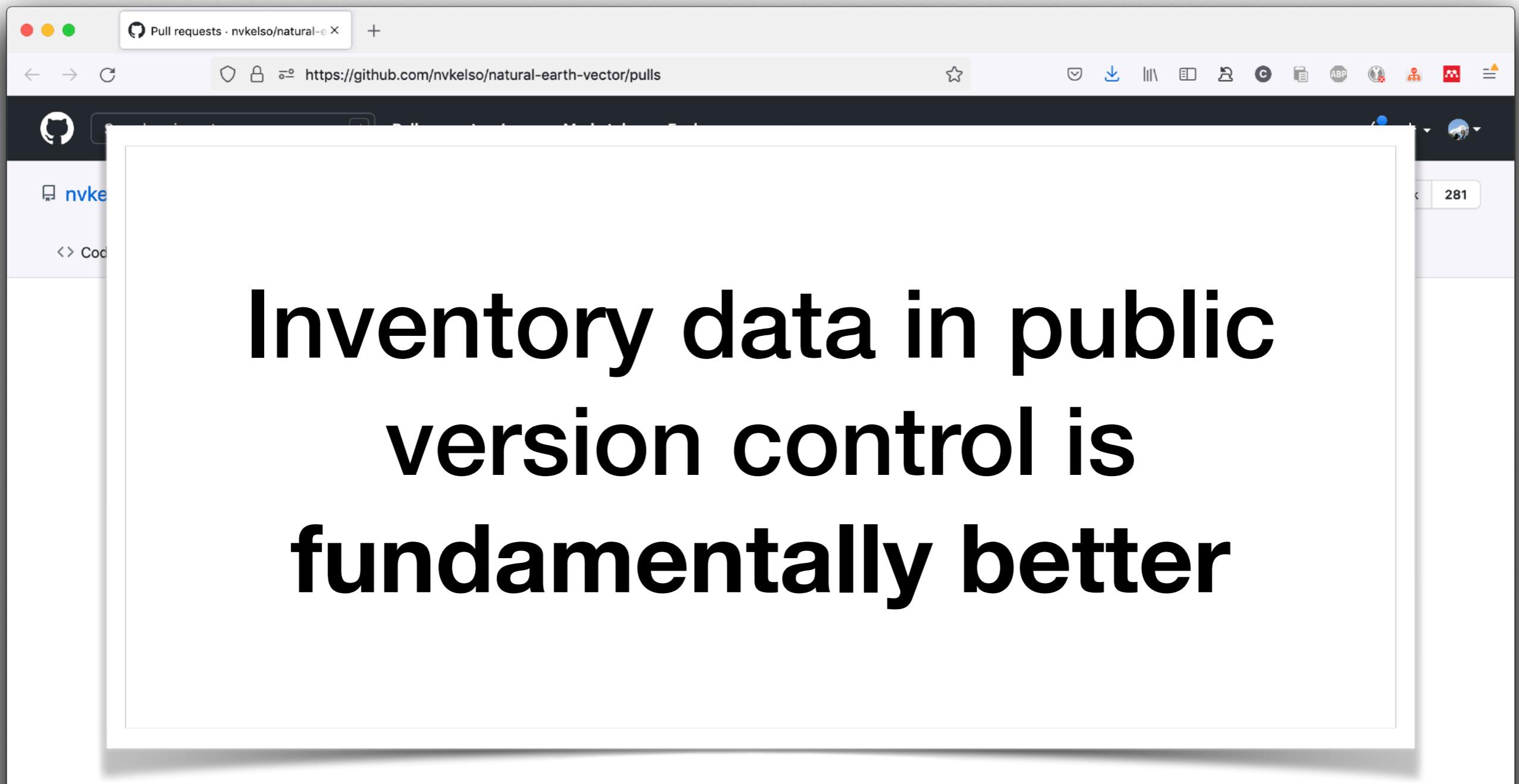
Sort: Sort dropdown

ProTip! Add no:assignee to see everything that's not assigned.

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Working effectively together

Using modern data infrastructure



Working effectively together

Role of ecoinvent

ecoinvent is a private organisation!

ecoinvent is a community resource!



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

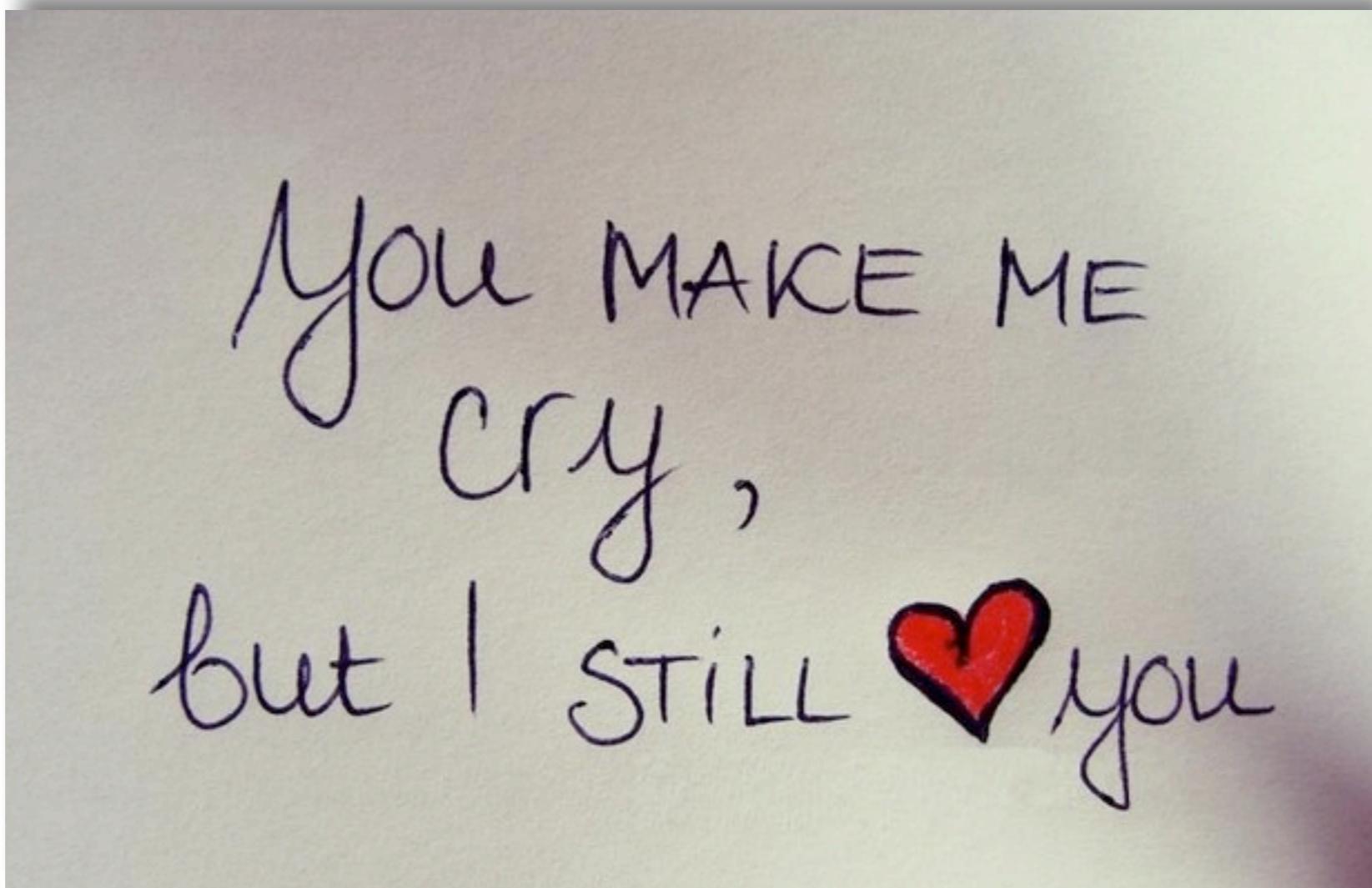
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- All substantial decisions should follow a proposal template

Working effectively together

Role of ecoinvent: Some specific suggestions

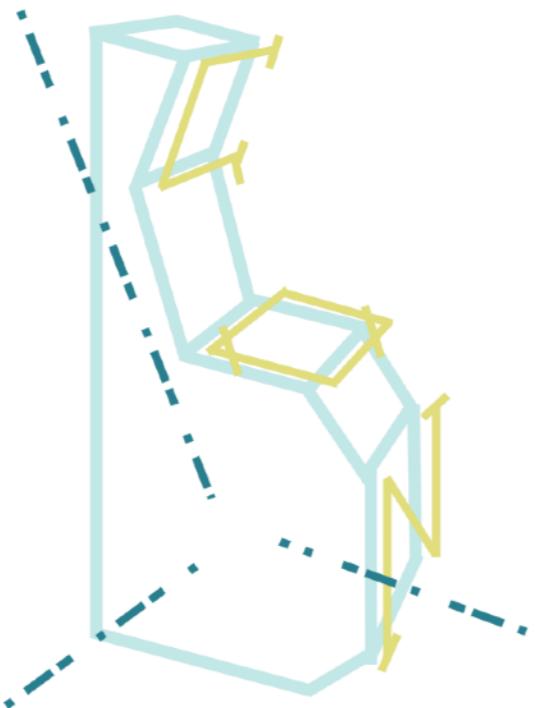
- All meeting minutes should be compiled and public
- Open ecoinvent data should be FAIR
- User community should have an ombudsman
- All substantial decisions should follow a proposal template
- All master data should be on Github

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>