

The Gamma

www.thegamma.net

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the guardian

Environment

China overtakes US as world's biggest CO2 emitter



Cyclists pass a factory in Yutian in China's north-west Hebei province. Photograph: Peter Parks/AFP

John Vidal and David Adam
Tuesday 19 June 2007 18.23 BST

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[China](#) has overtaken the United States as the world's biggest producer of carbon dioxide, the chief greenhouse gas, figures released today show.

The Guardian: China overtakes US as world's biggest CO2 emitter
The Economist: The East is Grey

Transparency Is it misleading?

- Is China the biggest polluter?
- University enrollment in Czech Republic

Reproducibility Is it correct?

- Critique of Piketty's Capital
- Reinhart-Rogoff Growth in Time of Debt

Data journalism



Illustration from: [Data journalism handbook](#)

Data driven articles

Not just text with visualizations, but...

- Can it be modified and reproduced?
- Is the source code available?
- Are the data sources referenced?

Data driven article is really a program!

The Gamma

Data driven article in The Gamma

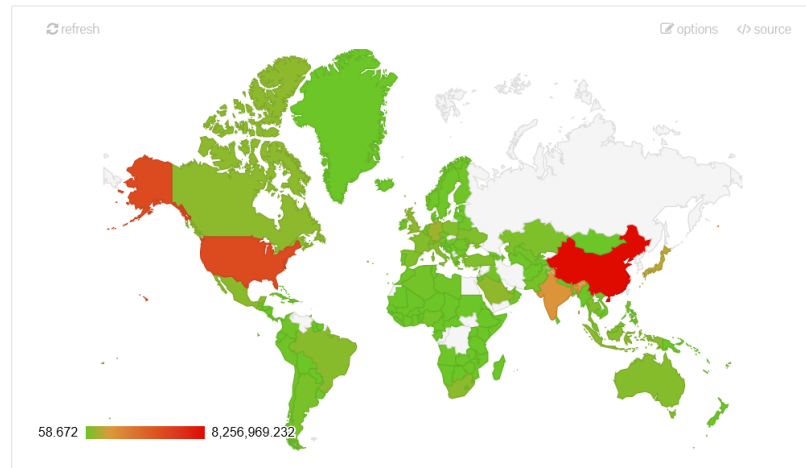
The world's biggest polluters

[edit](#)

Which countries of the world are responsible for the global warming? Looking at the data over the last 50 years tells us quite a lot - not just about the biggest polluters, but also about how the world has changed!

Carbon emissions today

If we look at CO2 emissions for the whole world for recent years, we can see the expected results. In general, the rich countries in America and Europe together with China and India are producing large percentage of the world's CO2 emissions. The map also shows the next group: Iran, Australia, Canada, Brazil and Saudi Arabia:



The Gamma: The world's biggest polluters

Article is a program view

There is no magic. It is just **code and text**!

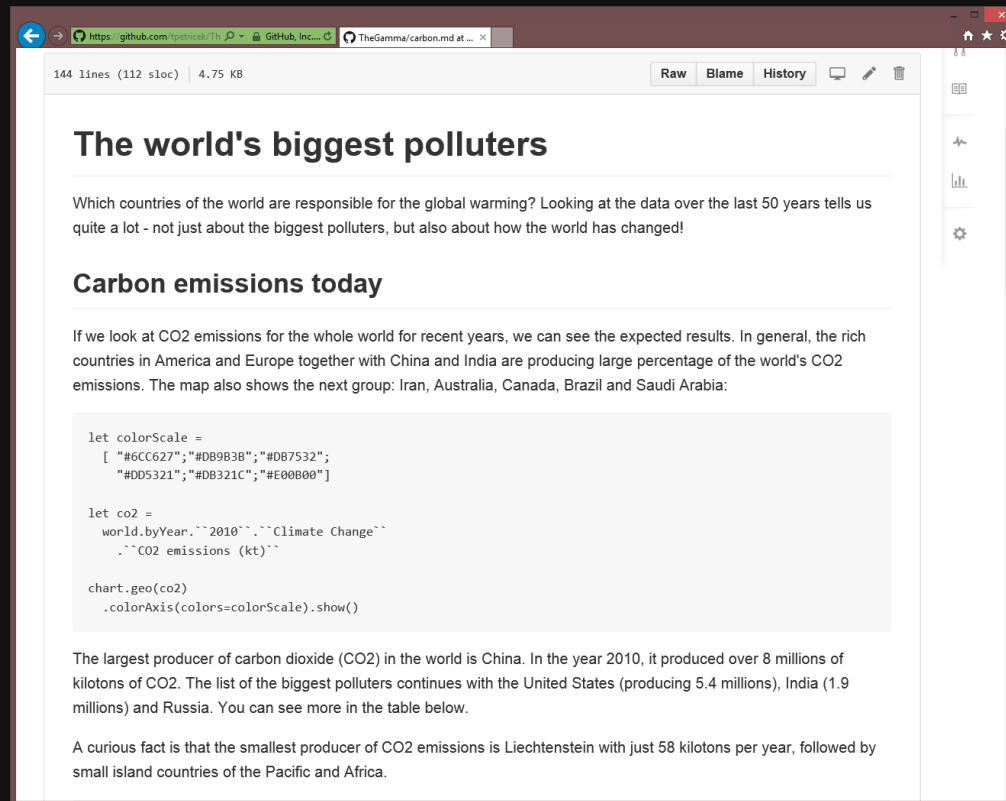
- We see the **journalist's story** first
- Readers can **modify the parameters**
- Power users can **see and modify the code**

Programming language research

Typed functional language with type providers

- Simple code with functional programming
- Editor support via static types
- Data access with F# type providers

Programming articles in The Gamma



The Gamma: The world's biggest polluters (source code)

Theory of type providers

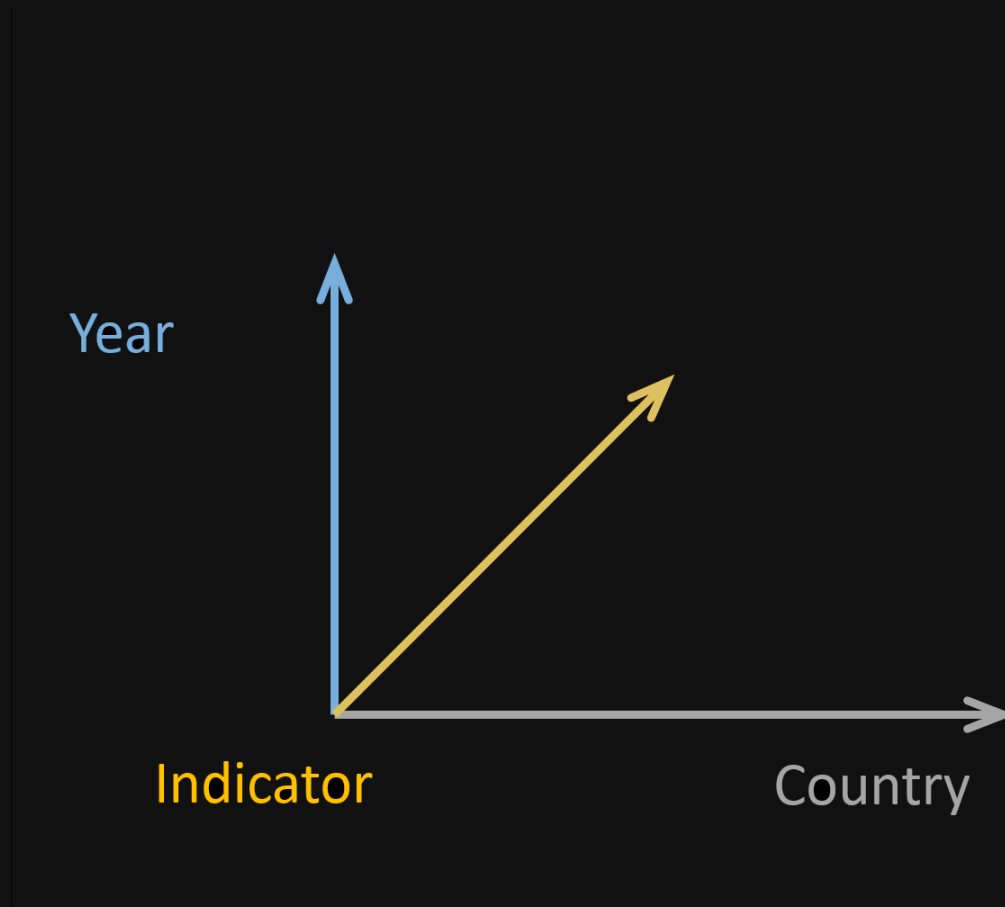
$$\Gamma \vdash e : \tau$$

$$\emptyset \vdash e : \tau$$

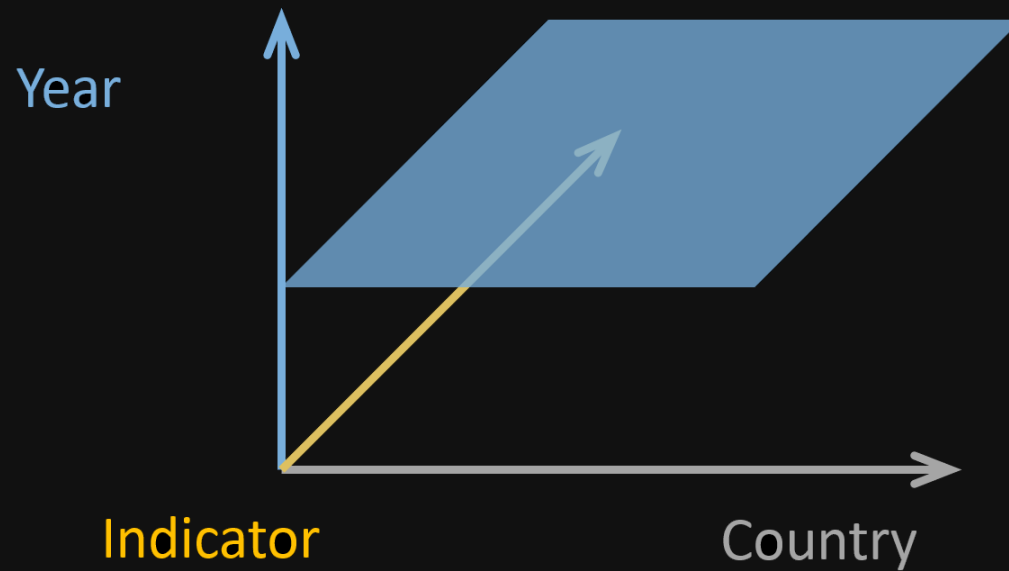
$$\pi(\text{🌐}) \vdash e : \tau$$

Technology behind

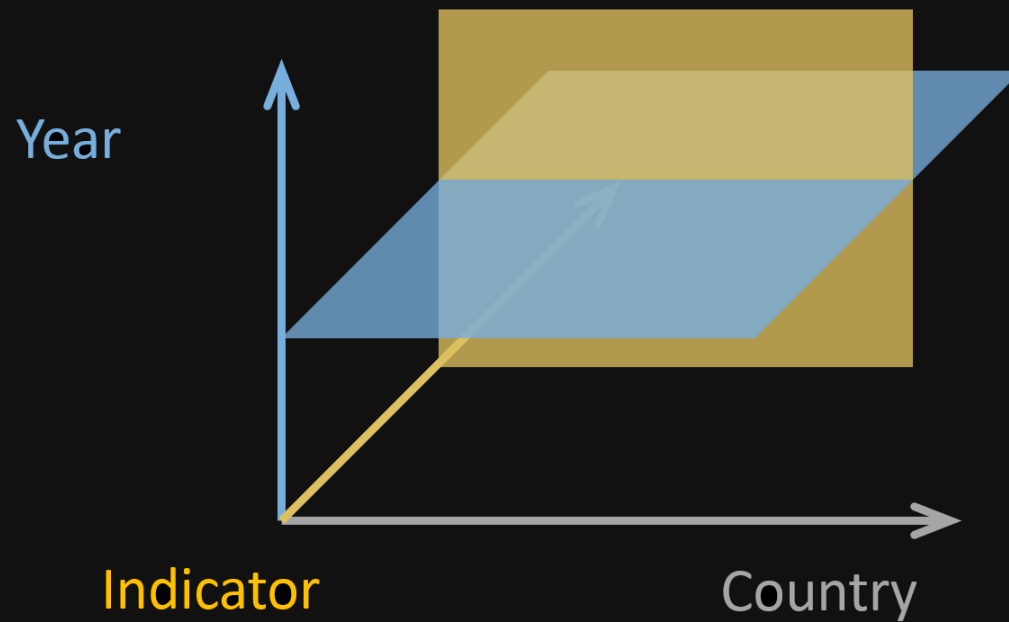
World bank data source



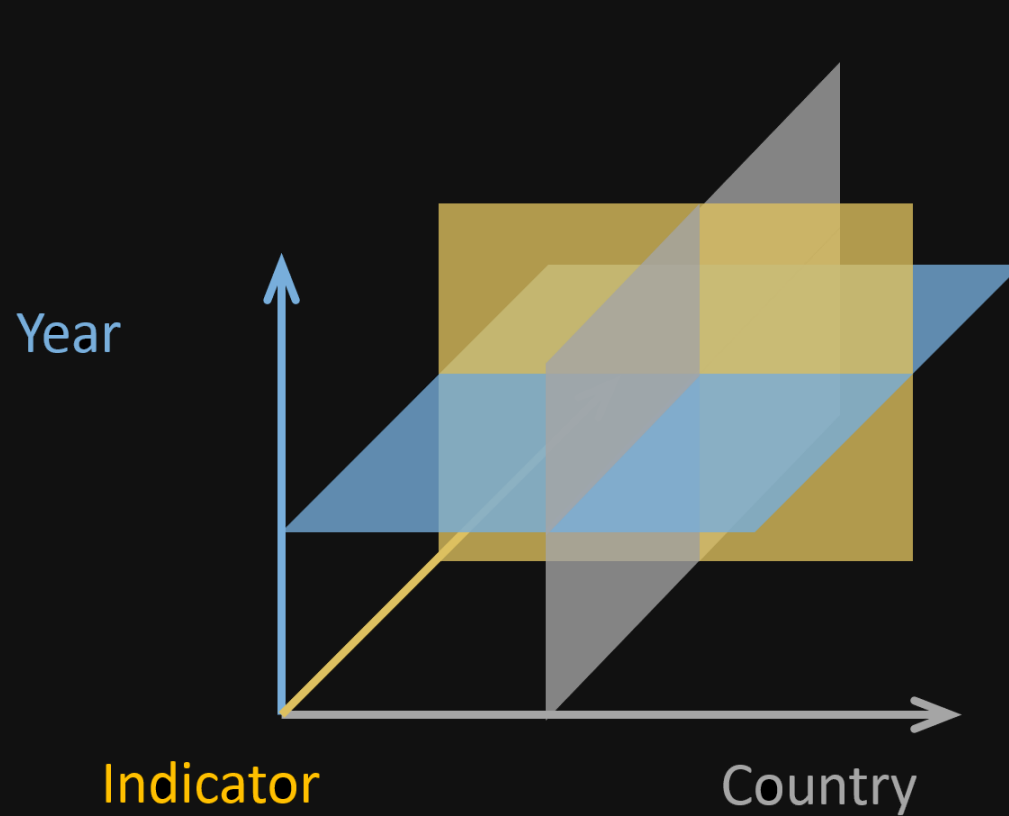
World bank data source



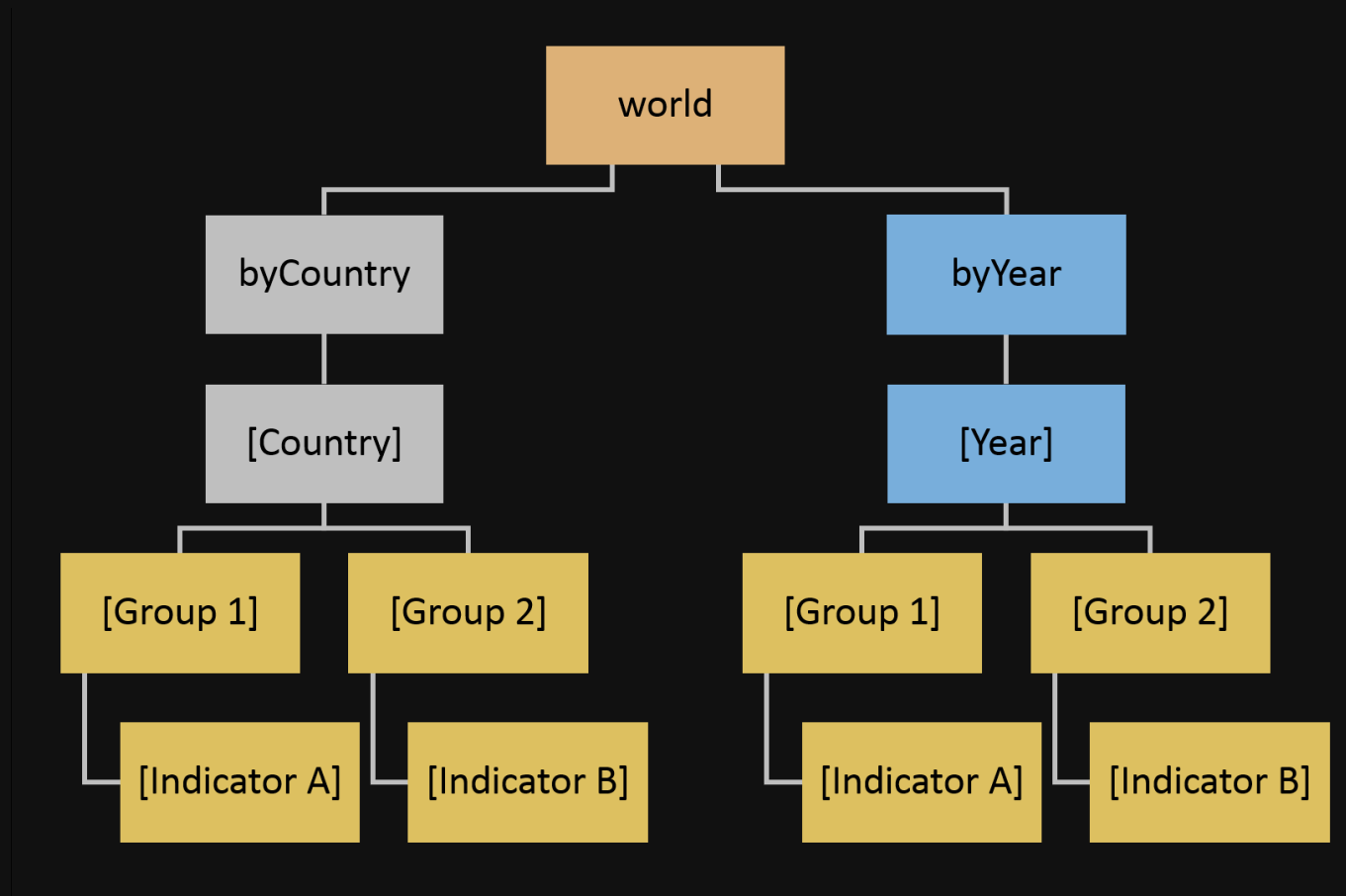
World bank data source



World bank data source



World bank type provider



Auto-generated options

One of members of the same type

```
1: let co2 =  
2:   world.byYear.`2010`.`Climate Change`  
3:   .`CO2 emissions (kt)`
```

List with sub-set of properties

```
1: let topCountries =  
2:   [ world.byCountry.China  
3:     world.byCountry.India  
4:     world.byCountry.Japan ]
```

Future directions

Future directions

Programming experiences research

- Usable **literate programming**
- Use PL for **provenance, context** and more!
- Mapping for **large-scale open government data**
- Grammar of **interactive visualizations**

Looking for early adopters :-)

Summary

- Information literacy
- Article is a program
- Future usable programming

Prototype <http://thegamma.net>

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